

# **Exhibit 3**

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF NEW JERSEY  
CIVIL ACTION NO. 15-6468 (FLW) (LHG)

-----	:	
NEW JERSEY DEPARTMENT OF	:	<u>DAUBERT HEARING</u>
ENVIRONMENTAL PROTECTION,	:	
et al.,	:	<u>JANUARY 9, 2019</u>
Plaintiffs	:	
v.	:	<u>VOLUME 1</u>
AMERADA HESS CORPORATION,	:	
et al.,	:	
Defendants	:	
-----	:	

CLARKSON S. FISHER UNITED STATES COURTHOUSE  
402 EAST STATE STREET, TRENTON, NJ 08608

B E F O R E: THE HONORABLE FRED A. L. WOLFSON, USDJ

A P P E A R A N C E S:

MILLER & AXINE, PC  
BY: DUANE C. MILLER, ESQUIRE  
-and-  
COHN LIFLAND PEARLMAN HERRMANN & KNOPF, LLP  
BY: LEONARD Z. KAUFMANN, ESQUIRE  
-and-  
STATE OF NEW JERSEY  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BY: GWEN FARLEY, DEPUTY ATTORNEY GENERAL  
-and-  
BERGER MONTAGUE  
BY: TYLER E. WREN, ESQUIRE  
On behalf of the Plaintiffs

(Continued.)

\* \* \* \* \*  
VINCENT RUSSONIELLO, CCR  
OFFICIAL U.S. COURT REPORTER  
(609) 588-9516

A P P E A R A N C E S C O N T I N U E D:

WEIL, GOTSHAL & MANGES, LLP  
BY: DAVID J. LENDER, ESQUIRE

-and-

ARCHER & GREINER, PC  
BY: CARLOS M. BOLLAR, ESQUIRE  
On behalf of Defendants ExxonMobil Corporation and  
ExxonMobil Oil Corporation

GOODWIN PROCTER, LLP  
BY: MARK E. TULLY, ESQUIRE  
On behalf of Defendants Gulf Oil Limited Partnership  
and Cumberland Farms, Inc.

**C E R T I F I C A T E**

PURSUANT TO TITLE 28, U.S.C., SECTION 753, THE  
FOLLOWING TRANSCRIPT IS CERTIFIED TO BE AN ACCURATE  
TRANSCRIPTION OF MY STENOGRAPHIC NOTES IN THE  
ABOVE-ENTITLED MATTER.

S/Vincent Russoniello  
VINCENT RUSSONIELLO, CCR  
OFFICIAL U.S. COURT REPORTER

1                   **M O R N I N G     S E S S I O N**

2  
3                   (In open court.)

4                   THE DEPUTY CLERK:   All rise.

5                   THE COURT:    Thank you.

6                   Everyone may be seated.   I'll have the  
7                   appearances of counsel who will be doing the  
8                   questioning this morning.

9                   MR. MILLER:    Good morning, your Honor.

10                  I'm Duane Miller on behalf of the State of New  
11                  Jersey.

12                  THE COURT:    Okay.

13                  MR. KAUFMANN:   Leonard Z. Kaufman of Cohn,  
14                  Lifland, Herrmann & Knopf, Saddle Brook, New Jersey,  
15                  on behalf of plaintiff.

16                  MS. FARLEY:   Gwen Farley, Deputy Attorney  
17                  General, State of New Jersey.

18                  MR. WREN:    Tyler Wren, Berger Montague, on  
19                  behalf of the State of New Jersey.

20                  MR. LENDER:   Good morning, your Honor.

21                  David Lender from the law firm of Weil,  
22                  Gotshal & Manges for ExxonMobil.

23                  MR. BOLLAR:   Good morning, your Honor.

24                  Carlos Bollar from Archer & Greiner on behalf  
25                  of ExxonMobil.

1 MR. TULLY: Good morning, your Honor.

2 Mark Tully from Goodwin Procter for Cumberland  
3 Farms and Gulf Oil Limited Partnership.

4 THE COURT: Thank you.

5 Everyone else who is here has signed in. So  
6 we have documentation of your appearance here today.  
7 I only wanted the appearances of those who will  
8 actually be participating in the hearing.

9 My understanding is that essentially the  
10 questioning is going to be done by Exxon and perhaps  
11 some by Cumberland Farms, and a number of sites are  
12 not going to be inquired about by other parties, so  
13 that the hearing is going to be truncated really from  
14 how many days we thought we would have. Correct?

15 MR. MILLER: Correct.

16 THE COURT: Off the record.

17 (Brief discussion off-the-record discussion.)

18 THE COURT: All set?

19 MR. MILLER: Yes, your Honor.

20 THE COURT: Present your witness, please.

21 MR. MILLER: Anthony Brown.

22 (Continued on the next page.)

23 ///

24

25

1     **ANTHONY BROWN**, called as a witness on behalf of the  
2     plaintiff, having been first duly sworn, testified as  
3     follows:

4  
5             THE COURT:   You may proceed.

6             MR. MILLER:   Good morning, your Honor.

7             We premarked the witness' 2013 and 2017  
8     reports as Exhibits 1 and 2 for the record for  
9     identification.

10            THE COURT:   All right.

11            MR. MILLER:   And then Exhibits 3, 4 and 5 are  
12     Power Points.

13            I have a courtesy copy for the Court.

14            THE COURT:   I'll take that.   It appears that  
15     it's generally been excerpts that have been provided  
16     in the briefing.   So do you have a full report to give  
17     me as well so I don't have to dig through various  
18     excerpts?   I was hoping you were bringing that today.

19            MR. MILLER:   Yes, your Honor.   As you can see  
20     by the thickness of the binder, it is a full report, I  
21     believe.

22            THE COURT:   You don't have to send it up to  
23     me.   But then I would appreciate, if you are going to  
24     be referring to a particular page, that you're either  
25     going to put it on the screen or give me that page so

1 I don't have to hunt through which exhibit it was to  
2 find it.

3 MR. MILLER: Yes, your Honor. I don't  
4 anticipate personally using the reports. I'm marking  
5 them for the record.

6 I assume counsel may question the witness  
7 about the reports, so I thought it would be  
8 convenient.

9 THE COURT: That's fine. I'm assuming if they  
10 are going to go to a particular page as well, they  
11 will be able to put it up for me.

12 MR. MILLER: Yes.

13 THE COURT: Okay.

14

15 DIRECT EXAMINATION

16 BY MR. MILLER:

17 Q. Good morning, Mr. Brown.

18 What is your profession?

19 A. Good morning. I am a hydrologist.

20 Q. Could you briefly explain what that science  
21 entails.

22 A. Certainly, yes. Hydrology is the scientific  
23 study of water as it appears on the surface and below  
24 the surface of the earth.

25 Q. Could you briefly describe for us your

1 educational background, particularly in that field.

2 A. Yes.

3 I have an undergraduate degree from Kings  
4 College, London, United Kingdom, in geography, with  
5 primarily a focus on hydrology, geomorphology, and  
6 soil science.

7 In addition, I have a postgraduate diploma in  
8 civil engineering from Imperial College, London, and a  
9 Masters of Science Degree in engineering hydrology  
10 from Imperial College, London.

11 Q. Since we're not necessarily familiar with  
12 English universities, could you give us some  
13 indication of its stature, please?

14 A. Certainly, yes. Imperial would be the premier  
15 science and engineering university within the U.K..  
16 I'm sure Imperial would argue it's within the world.  
17 But I think Cal Tec and MIT are probably the other two  
18 comparable institutions within the United States.

19 Q. Do you actually exchange students with those  
20 universities?

21 A. Yes. The majority of research collaboration of  
22 Imperial is actually with MIT.

23 Q. Now, in the past have you held positions with  
24 environmental engineering firms?

25 A. Yes. I finished my graduate work in 1988, and

1 since then I have been working as a groundwater  
2 consultant.

3 Q. Were you with the Worley Parsons firm?

4 A. Yes. I actually started my own company in 1992  
5 which eventually became called Komex. We sold that  
6 company to Worley Parsons, who is a very large global  
7 oil and gas consulting firm.

8 Q. What was your position with Worley Parsons?

9 A. I ran their global infrastructure and  
10 environment business sector, which is about 3,500  
11 employees worldwide. And I also handled mergers and  
12 acquisitions and strategic developments for the  
13 Americas.

14 Q. Now, have you spent part of your career dealing  
15 with the subject of MTBE?

16 A. Yes. I have spent a considerable amount of  
17 time, starting in the early 1990s right up to the  
18 current time, I have been working almost consistently  
19 on projects that involve MTBE contamination.

20 Q. Have you been consulted or provided advice to  
21 governmental agencies concerning MTBE?

22 A. Yes. I have government clients, particularly  
23 various states that have filed claims related to MTBE  
24 contamination of groundwater resources, as well as  
25 county and municipal clients who, again, having to

1 deal with MTBE contamination of water supplies.

2 THE COURT: Let me interrupt.

3 Mr. Miller, all of this background, if this is  
4 going to his qualifications, there is no objection to  
5 his qualifications it's my understanding from having  
6 read the Daubert papers.

7 MR. TULLY: That's correct, your Honor.

8 THE COURT: I have all that material. I find  
9 him qualified. If you want to proffer the areas he is  
10 in, I know there is no objection, let's just do it,  
11 and we can go on to the substance of the testimony.

12 MR. MILLER: That's fine, your Honor.

13 BY MR. MILLER:

14 Q. Mr. Brown, in what areas are you acting as an  
15 expert witness in this case?

16 A. I'm providing expert witness testimony in the  
17 areas of groundwater hydrology and groundwater  
18 restoration.

19 MR. MILLER: We would offer him as an expert  
20 in those fields, your Honor.

21 THE COURT: My understanding is that there is  
22 no objection to his qualification in those areas. Is  
23 that correct?

24 MR. LENDER: Not referring to the Daubert  
25 motions. We didn't move on that basis.

1 THE COURT: Exactly.

2 MR. TULLY: Correct, your Honor.

3 THE COURT: All right. He will be accepted as  
4 the expert in those areas, and we'll get to the actual  
5 opinions.

6 BY MR. MILLER:

7 Q. Mr. Brown, I want to go briefly over your  
8 experience.

9 Have you worked with oil companies dealing  
10 with contamination?

11 A. Yes, I have. I have worked for a variety of oil  
12 companies during the course of my career. I would say  
13 the majority of work was for originally Mobil Oil  
14 Corporation, now ExxonMobil.

15 Q. In doing that work, have you dealt with  
16 contamination from gasoline at service stations?

17 A. Yes, I have. I've implemented actually  
18 investigation and remediation programs at over 100  
19 service station sites and numerous field terminals,  
20 pipeline releases and refineries.

21 Q. The technique or method that you used to  
22 investigate and proposed programs to clean up those  
23 sites, is that also something that you did for this  
24 case?

25 A. Yes. The methodologies I would use in

1 evaluating those sites would be identical to those  
2 that I used in this matter.

3 Q. In terms of the methodologies that we're going  
4 to discuss this morning that you employed in this  
5 case, are they generally accepted?

6 A. Yes. These are the methodologies that any  
7 consultant or even any expert would use when  
8 evaluating any contaminated site including those  
9 contaminated with MTBE and other gasoline  
10 constituents.

11 Q. Now, if we could turn to the slides. We're  
12 going to cover something extremely briefly. This is a  
13 matter that relates to qualifications. So could we go  
14 to the next slide.

15 It mentions that you went to the White House  
16 to advise them on MTBE? Is that correct?

17 A. It is, yes. Under the Clinton administration I  
18 was invited to present at the White House.

19 Q. Could we have the next slide, please.

20 We're going to be using some terms and one of  
21 them is the "vadose zone." Can you explain what that  
22 is briefly, please?

23 A. Certainly, yes. If we refer to the figure here,  
24 we can see this brown line is the ground surface, and  
25 there is a tree growing here. And initially when one

1 moves through the subsurface, there is an area of the  
2 subsurface where the pore spaces -- that is the voids  
3 between the soil grains or the facies in the rock are  
4 not completely saturated with water, and that's  
5 referred to as either the "unsaturated zone" or the  
6 "vadose zone". And then eventually we move to a point  
7 where the pore spaces as can be seen here are  
8 completely saturated with water, and that's what we  
9 call the "groundwater zone" or it's referred to as an  
10 "aquifer."

11 Q. Is there a transition zone between the two?

12 A. Yes. There is a small transition zone called  
13 the "capillary fringe," which is saturated with water  
14 but it's under negative pressure.

15 Q. And in terms of the terminology we're going to  
16 be using today, we're going to be focusing on both the  
17 "vadose zone" and the "saturated zone." Is that  
18 correct?

19 A. To a degree, yes. However, the majority of the  
20 discussion today I would assume would be related to  
21 the groundwater.

22 Q. Now, the settings in New Jersey that relate to  
23 cases that we're going to discuss this morning, what  
24 geological settings are we talking about?

25 A. Perhaps if we go to the next slide, this slide

1 depicts some of the typical geologic materials we  
2 would see in the State of New Jersey. There are  
3 basically two types of geologic materials:

4           The first I'll refer to as "unconsolidated  
5 sediments," and these are comprised of sands, gravels  
6 silts, and clays. So they are not cemented into any  
7 form of rock. They are just like a loose sand you  
8 might see at the beach. These are depicted here as  
9 these yellow areas on the slide being the sands, and  
10 in this case a till which is a glacial deposit of more  
11 finer grained material.

12           The other type of geologic material we see  
13 here in New Jersey is competent bedrock, solid rock.  
14 Here, while some bedrock has what's referred to as  
15 primary porosity, that is some pore space, the  
16 majority of the bedrock contains water in fractures.

17           These are cracks in the rock that are usually  
18 vertical, subvertical, or horizontal, and the water  
19 enters these fractures rather than moving through  
20 interconnected pores. So the water is much more  
21 variable in its location within the fractured rock.

22 Q.       And you can actually develop a well in the type  
23 of fractured rock we have here in New Jersey. Is that  
24 correct?

25 A.       That's correct. There are many large municipal

1 water supply wells in fact that are completed into  
2 bedrock aquifers. Because of the interconnection of  
3 the pores in unconsolidated sediments, any well will  
4 essentially draw water from throughout the entire area  
5 of the sediments; whereas in fractured rock it will  
6 only draw water from the fractures that well connects  
7 with.

8 So if we have a well, say, this one on the  
9 right, it only connects to one fracture. Therefore,  
10 its yield will be quite low; whereas, the well here  
11 just to the left of it intersects many water bearing  
12 fractures. Therefore, it will have much higher water  
13 yields when it's pumped.

14 Q. If we compared the two types of deposits in the  
15 subsurface, the fractured rock versus the  
16 unconsolidated materials, which of the two is more  
17 complex to understand when you are dealing with  
18 contamination?

19 A. Certainly the fractured rock is much more  
20 complex because one has to understand the orientation,  
21 the density of the fractures, as well as the general  
22 groundwater conditions.

23 Q. And does that affect your ability to predict  
24 where MTBE may be present in the subsurface, that is  
25 when it enters fractured rock environments?

1 A. Yes, it does. Perhaps an example: In my career  
2 I worked on a major gasoline spill from a pipeline;  
3 consulting work I was performing for Shell in  
4 Kankakee, Illinois, where they had a release from the  
5 pipeline. The groundwater flow direction suggested  
6 the plume would go in one direction. However, the  
7 fractures were oriented about 45 degrees to the  
8 groundwater flow. Therefore, the plume had actually  
9 moved 45 degrees and contaminated wells that no one  
10 had expected would be contaminated.

11 Q. So understanding fracture orientation is part of  
12 the information you need to have and consider it to  
13 predict the movement of MTBE in the subsurface. Is  
14 that correct?

15 A. Where one can identify that, that is very  
16 valuable. It's very difficult to do actually in urban  
17 areas just because any surface expression of those  
18 fractures is no longer evident.

19 Q. If we could turn to the next slide, please?

20 We're not going to go through each of these  
21 bullets. But basically you were retained in 2012 to  
22 work on this case and to evaluate each of the original  
23 19 sites. Is that correct?

24 A. Yes, that is correct.

25 Q. Today you are prepared to discuss a subset of

1 those, a total of four, but two you will be testifying  
2 on this morning. Correct?

3 A. That's my understanding, yes.

4 Q. Could you explain what your assignment was  
5 briefly, please, in this case?

6 A. Yes.

7 We would review information pertinent to the  
8 trial sites, and based upon that review of both  
9 regional and site-specific information, at certain  
10 trial sites we identified some real critical data  
11 gaps. Therefore, we implemented field investigations.  
12 And for all of the sites where there was off-site  
13 groundwater contamination, we evaluated what would be  
14 feasible and technical technologies to restore the  
15 groundwater to a pre-discharge condition.

16 Q. You used the term "we." Could you explain?

17 A. I apologize. I have my own consulting firm.  
18 It's a small firm of about 12 staff. So some of the  
19 work would be performed by staff under my direction.

20 Q. Okay. In terms of your evaluation of the data,  
21 what were you trying to get, what type of information?

22 A. As I indicated, there would be two types of data  
23 sets: The first would be regional information that  
24 would allow us to develop essentially what we refer to  
25 as a site setting. So regional hydrogeology, regional

1 groundwater flow conditions.

2 Q. Is regional information useful in making  
3 predictions at a specific site?

4 A. Very useful, yes.

5 Q. Could you briefly explain it.

6 A. Certainly, yes.

7 For example, groundwater, essentially, in  
8 general, moves from what are referred to as areas of  
9 recharge -- that's where there is water recharging the  
10 aquifer -- to areas of discharge, and those discharge  
11 locations are usually large water wells that are  
12 pumping or a surface water body that's being supplied  
13 with groundwater. That relationship between areas of  
14 recharge and areas of discharge will often drive the  
15 flow from one to the other.

16 So it's important to understand that on a  
17 regional basis. So where are the wells that will  
18 essentially drive a lot of the groundwater flow.

19 Q. How does someone in your field determine the  
20 direction of groundwater flow and why is it important  
21 to do that?

22 A. So there are essentially two ways to evaluate  
23 groundwater flow.

24 The first would be an inferred flow based upon  
25 that recharge/discharge relationship. So if we know

1 we have large water supply wells, it's pretty clear  
2 that the flow around those wells -- it could be many  
3 miles -- would be towards those wells.

4 Now, we also could use actual site data where  
5 we have installed monitoring wells. These are wells  
6 that are not wells to produce groundwater but just  
7 monitor the groundwater. We can actually measure the  
8 water levels in those wells, and from those  
9 measurements we can determine the groundwater surface  
10 and gradient, so we know based on those measurements,  
11 just as if you were measuring the elevation on a hill,  
12 where is the down-gradient direction.

13 So we can use both site data and inferred  
14 regional information to determine the direction of  
15 groundwater flow.

16 Q. So basically groundwater is flowing downhill?

17 A. Essentially, yes, in simple terms. It's related  
18 to other factors, but, generally, topography is one of  
19 the key factors in evaluating groundwater flow.

20 Q. So if you measure the groundwater level in a  
21 well here, and it's higher than a point here, what  
22 inference do you draw based on the science that you  
23 are part of?

24 A. One of the key elements of hydrology is that  
25 groundwater will always move from a condition of high

1 hydraulic head, high elevation, to a condition of low  
2 hydraulic head. That's a lower elevation. So as you  
3 say it flows downhill.

4 Q. You used the term "head." What does that mean?

5 A. "Head" is just the reference to, in this case,  
6 evaluation within an unconfined aquifer versus  
7 elevation plus pressure within a confined aquifer.

8 Q. And then if we go to the other setting, which is  
9 the fractured rock, do you use the same approach to  
10 determine the direction of flow or is it more complex?

11 A. As I indicated earlier, it's a little more  
12 complicated because one can first measure the actual  
13 groundwater flow direction based on elevations. The  
14 groundwater can only flow within the fractures. So  
15 the fractures may have an orientation that is slightly  
16 different than the overall groundwater flow field.

17 I'll give an example. If you are standing at  
18 the top of the hill, and you want to drive down the  
19 hill, the most direct way is straight down the hill.  
20 However, if the road zigzags all the way down the  
21 hill, as might be a fracture network, you have to  
22 follow the road.

23 Q. Okay. You mentioned that a well can draw water  
24 from several miles away. How does that work? Could  
25 you explain that briefly?

1 A. Certainly, yes.

2 When a groundwater well starts to pump water,  
3 it essentially lowers the groundwater, the elevation  
4 in the vicinity of the pumping well, and it creates  
5 what's referred to as a cone of depression. So  
6 essentially as it withdraws water from the aquifer, it  
7 creates a cone around the well. That is the area  
8 around the well is being depleted of water because it  
9 is being pumped; and as the pumping continues, that  
10 cone gets deeper and gets very, very wide because it's  
11 drawing water from a very large area.

12 Q. In effect, it creates its own depression in the  
13 water surface?

14 A. That is correct, yes.

15 Q. And that depression causes the water to move  
16 toward the well?

17 A. That is absolutely correct, yes.

18 Q. Now, in this case, in addition to evaluating the  
19 setting and the sites, you were asked to evaluate  
20 feasible and practical technologies to restore the  
21 groundwater to a pre-discharge condition. I want to  
22 start with, what is a "pre-discharge condition"?

23 A. A pre-discharge condition would be the state of  
24 the groundwater prior to the release of the  
25 pollutants.

1 Q. So in this case we are talking about MTBE. Is  
2 that naturally present in groundwater?

3 A. No, it is not.

4 Q. Is it primarily associated, based on your  
5 expertise and experience, with gasoline stations and  
6 similar sources of gasoline releases?

7 A. Yes. MTBE was most predominantly used as an  
8 oxygenate in reformulated gasoline.

9 Q. What is "reformulated gasoline"?

10 A. Essentially, it's gasoline that had its basic  
11 formula adjusted by the addition of an oxygenate, and  
12 the most common oxygenates are either ether  
13 oxygenates, MTBE being far the most common, or  
14 alcohol-based oxygenates, most notably ethanol.

15 Now, originally, those compounds were added to  
16 enhance the octane value of the fuel, make it burn  
17 more efficiently. And then in response to Clean Air  
18 Act amendments, it was required to add an oxygenate to  
19 gasoline in certain areas of the country.

20 Now, those areas coincided with most of the  
21 population and most of the refineries. So oxygenated,  
22 reformulated gasoline in response to the Clean Air Act  
23 amendments was widely used throughout the United  
24 States.

25 Q. Roughly what percentage of the gasoline was MTBE

1 and this reformulated gasoline you described?

2 A. It varied depending on the grade of the  
3 gasoline, between 11 and 15 percent by volume.

4 Q. Was that the single largest constituent in  
5 gasoline during the period of time that MTBE was in  
6 gas?

7 A. Yes, by far.

8 Q. Are there other industries unrelated to gasoline  
9 that are known to be sources of MTBE releases?

10 A. The only other ones would be the chemical plants  
11 where they are actually making the MTBE. Other than  
12 that, the uses are very, very minor. And I never  
13 identified a contamination source other than a  
14 gasoline release when it comes to MTBE contamination  
15 of groundwater.

16 Q. Okay. Now, did you come up with and evaluate  
17 the feasibility of technologies to restore groundwater  
18 for this case?

19 A. Yes, I did.

20 Q. Did you do it for the two sites we are going to  
21 discuss this morning?

22 A. Yes. We prepared actually an initial  
23 feasibility evaluation that addressed all of the  
24 sites, and evaluated eight different technologies that  
25 could be used to restore the groundwater. And then we

1 considered that on a site-specific basis, so for each  
2 of the sites based on the conditions at that site,  
3 which would be the most appropriate technology to use  
4 to restore the groundwater to a pre-discharge  
5 condition at that particular site.

6 Q. Did you consider whether those technologies were  
7 practical?

8 A. Yes. Essentially, the guidelines for doing a  
9 feasibility analysis, evaluate the feasibility based  
10 on three criteria: effectiveness, implementability,  
11 and cost. Essentially, effectiveness and  
12 implementability together determine whether the  
13 technology is practical.

14 Q. We're going to go into that more specifically in  
15 a minute. If we can go to the next slide, please.

16 This describes briefly your overall approach  
17 in doing the work in this case and other matters. Is  
18 that correct?

19 A. Correct, yes. It describes essentially the fact  
20 that the methodology that I used in this particular  
21 matter is identical to the methodologies that I have  
22 used in many other projects. In fact, just about  
23 every contaminant project that I work on, I use the  
24 same procedures.

25 Q. Is that true for when you were working on

1 gasoline station sites for the oil industry, that you  
2 used the same procedures?

3 A. Yes, it would be the identical procedures.

4 Q. And the experts for the defendants that prepared  
5 reports in this case, you reviewed them?

6 A. I did, yes.

7 Q. Did they use the same procedures that you did?

8 A. Yes. Essentially, these are the procedures that  
9 are used by all consultants when evaluating a  
10 contaminated site.

11 Q. Do you currently have clients in the oil  
12 industry?

13 A. Yes, I do.

14 Q. And when you are evaluating conditions to  
15 consider a remediation restoration, here you've got  
16 sites that you evaluated. Approximately how many have  
17 you done this type of analysis for?

18 A. So I have actually used the methodology as part  
19 of the implementation of the actual investigation and  
20 remediation programs at over 150 contaminated sites,  
21 of which about 100 would be gasoline release sites,  
22 and the others would be other types of contaminants.

23 I've also used the methodologies to evaluate  
24 conditions at over 500 contaminated sites, of which  
25 300 or more would be gasoline release sites. This

1 would be where I was working for a party that was not  
2 the responsible party for contamination but had been  
3 impacted by the contamination. For example, a state  
4 agency, a county government, or a municipal  
5 government.

6 Q. Okay. Let's go to the next slide, please.

7 Further discussion of the overall approach  
8 that you took in this case.

9 Did the experts for the defense arrive at the  
10 same conclusions you did if they used the same  
11 methodology?

12 A. In some cases, some of the conclusions are  
13 similar if not identical. I would say many of the  
14 cases they used the same methodology but they reached  
15 a different conclusion based upon their analysis.

16 Q. Now, in terms of implementing an investigation,  
17 did you do some investigative work in this case?

18 A. Yes. We did two types of investigative work.  
19 The first would be the review and analysis of existing  
20 information. The second would be actual field  
21 investigations where we went to a site and drilled  
22 monitoring wells and collected samples in some other  
23 way.

24 Q. Did you believe before you rendered your expert  
25 reports in 2013 and 2017 that you had the information

1 you needed to form your opinions?

2 A. Yes, I did.

3 Q. Now, let's go to the methodology itself.

4 The first item you list out of four is  
5 understanding the site setting and identifying  
6 receptors or potential receptors. In this context,  
7 what is a "receptor"?

8 A. So a receptor in this context could be one of  
9 three things.

10 The first could be the groundwater itself, and  
11 that it has been impacted by the pollution, so it is a  
12 receptor.

13 The second might be a water supply well, which  
14 could be a domestic well for a single residence or a  
15 large municipal well that is either impacted or  
16 threatened by that contamination.

17 The third would be perhaps a surface water  
18 body, such as a stream or a lake or a wetland where  
19 groundwater recharges that surface water body, and  
20 there is a risk that the contamination could move with  
21 the groundwater and contaminate that surface water  
22 body.

23 Q. The next step in the process is to evaluate  
24 contaminants of concern. In this case, there are two  
25 contaminants of concern. Is that correct?

1 A. There are two particular contaminants we are  
2 concerned about. The first we mentioned is MTBE,  
3 methyl tertiary butyl ether, and the second is  
4 tertiary butyl alcohol, or TBA.

5 Q. Is TBA also an oxygenate for gasoline?

6 A. It had been used either directly as an  
7 oxygenate, but it is also present as essentially an  
8 impurity within MTBE, and it also is a degradation  
9 product of MTBE.

10 Q. Is that also a chemical that the government has  
11 some concern about and regulates it just as it does  
12 MTBE?

13 A. That is correct.

14 Q. Now, did you consider the applicable regulations  
15 in New Jersey that applied to those two chemicals in  
16 evaluating evidence in this case?

17 A. I did, yes.

18 Q. Why would it be important to understand the  
19 level the government is concerned about on a  
20 regulatory basis in doing your work?

21 A. There are two considerations.

22 The first is the government essentially  
23 establishes risk-based levels; that is, some  
24 concentration that they believe there is an acceptable  
25 risk for consuming or being exposed to that particular

1 chemical below a certain concentration, and that is  
2 referred to on the national level as a maximum  
3 contaminant level or an MCL.

4 Q. Do MCLs apply, for example, to public drinking  
5 water?

6 A. That is correct. So for a public drink water  
7 supply, a purveyor of that drinking water must comply  
8 with the standards that are imposed either by the  
9 federal or state government; and usually most water  
10 utilities, if they reach 50 percent of that standard  
11 have to implement some kind of mitigation, either  
12 treatment or take the well offline, or some other  
13 process to ensure they don't deliver that water in  
14 those concentrations to their customers.

15 Now, if I could go back to the first question.  
16 I had not quite finished.

17 Q. Sorry. Go ahead.

18 A. So the MCLs are a risk-base standard  
19 essentially. That is, they understand that exposure  
20 even below the MCL poses some risk, but they believe  
21 it to be an acceptable risk.

22 The other standard is the point at which there  
23 is no perceived public health risk, and that's  
24 referred to at the federal level as a maximum  
25 contaminant level goal, or an MCLG.

1           Now, in addition to those levels, many states  
2     have what they refer to as a "nondegradation  
3     standard," or, in the case of New Jersey, a  
4     "pre-discharge standard." That is, essentially, the  
5     State does not allow degradation of one of the State's  
6     resources to any degree. Therefore, restoration is  
7     the cleanup of a particular resource, in this case,  
8     groundwater, to a pre-discharge condition.

9     Q.     And for a chemical like MTBE or TBA, is it your  
10    understanding then in New Jersey, that level is  
11    basically the level at which you can detect it in a  
12    chemical laboratory?

13   A.     Yes. So by clear inference, the level should be  
14    zero because it's not a naturally occurring compound,  
15    but one is limited by the detection limit that a  
16    laboratory has. How low can it detect the compound?  
17    And that's called the "practical quantitation limit"  
18    or PQL.

19   Q.     When you prepared your reports in this case, you  
20    proposed programs in some sites where the groundwater  
21    would be cleaned up. Correct?

22   A.     Correct, yes.

23   Q.     And in setting a cleanup program or planning it,  
24    is it important to understand what the goal is in  
25    terms of the concentration, what it should be?

1 A. It's very important. That's essentially your  
2 target, your end point.

3 Q. And in this case, when we talk about remediation  
4 versus restoration, what are we talking about?

5 A. Essentially, remediation is the cleanup of a  
6 resource, in this case, groundwater to those  
7 risk-based standards. Whereas, restoration is the  
8 cleanup to the pre-discharge condition.

9 Q. You indicate in your third step that you  
10 followed in your methodology is to prepare a detailed  
11 summary of site-specific information, and you list  
12 four items that are part of that. Correct?

13 A. Yes. These are four of the typical elements  
14 that we implement as part of our review of  
15 site-specific information.

16 Q. Obviously, one of the things you want to do is  
17 understand the contamination that is present at a  
18 site, you list that, and then you talk about  
19 contaminant, fate, and transport. Are those technical  
20 terms in your field?

21 A. Yes. As you mentioned, the first step is just  
22 based upon the existing data. Where is the  
23 contamination? What is the magnitude? What are the  
24 concentrations? Where was it potentially released  
25 from?

1           The second element, the bullet there, is:  
2       Where might it go?

3           So what is the fate and transport? Because of  
4       MTBE's particular properties, it essentially goes  
5       where the groundwater goes.

6       Q.     We'll cover that in a minute.

7           You also indicate another thing you do is  
8       identify deficiencies in existing work and data gaps.  
9       Why is that important?

10      A.     Well, one needs to identify particular data gaps  
11      that might limit your ability to complete the  
12      evaluation. Those would be critical data gaps. And  
13      at some of the sites we did identify those and  
14      actually implemented field programs.

15           In others there would be data gaps that would  
16      not limit your ability to reach opinions and develop  
17      restoration programs, but still need to be completed  
18      at some point in the future or addressed.

19      Q.     And as part of your work, did you also consider  
20      and in some cases recommend additional investigation?

21      A.     Yes. In some cases we actually implemented  
22      investigation. But in all of the remaining sites, we  
23      did actually recommend future additional investigation  
24      does need to be performed.

25      Q.     Did you have as one of your resources of

1 information reports from consultants retained by oil  
2 companies who had a release site and had done their  
3 own investigation?

4 A. Yes. I would say that was the majority of  
5 information reviewed as part of our site-specific  
6 analysis.

7 Q. Apart from that, what other types of information  
8 would you get that would help you review and summarize  
9 site-specific information?

10 A. There may be in fact some records of actual  
11 release events at a station. There may be records of  
12 underground storage tank removal programs or gasoline  
13 piping replacement programs at each station. These  
14 may not be contained within the consultant reports but  
15 they would be available for a particular site.

16 Q. Did you attempt to get all of that type of  
17 information to the extent it was available?

18 A. We did, yes.

19 Q. Let's turn to Step 1. This is the regional  
20 information.

21 Is this basically a listing of the types of  
22 information that you use and consider in understanding  
23 the regional setting?

24 A. It is. This is some of the typical information  
25 that one tries to identify and review. As we

1 mentioned, just the location and topography, the  
2 geologic and groundwater conditions, the surface water  
3 hydrology conditions; are there streams nearby that  
4 could be receptors, for example? Are there water  
5 supply wells, information on receptors, such as  
6 domestic and municipal supply wells? What's the local  
7 land use? So, for example, are there residences that  
8 sit on top of the contaminant plume that might be  
9 exposed to vapors coming from that plume?

10 Basically, that forms essentially an  
11 understanding of the region for the setting for a  
12 particular site.

13 Q. Let's go to the next slide.

14 Are there properties of MTBE that are  
15 important to understand in making predictions about  
16 how it will behave in the environment?

17 A. Yes. Gasoline containing MTBE or the MTBE  
18 within that gasoline has certain chemical properties  
19 that make it behave quite differently than gasoline  
20 that doesn't contain an oxygenate when it comes to a  
21 release into the environment and its impact to  
22 groundwater.

23 Q. So one of the things that can happen when a  
24 chemical is released is it can dissolve into  
25 groundwater. Correct?

1 A. Yes. Often you hear the old adage, oil and  
2 water don't mix. Unfortunately, they do. Some of the  
3 constituents within oil that dissolve into the water  
4 and particular MTBE is highly soluble in water. So  
5 you can have a transfer of the MTBE from the gasoline  
6 that was released into the groundwater, so it  
7 dissolves into that water.

8 Q. Is MTBE so soluble that you can literally find  
9 it present in levels as high as millions of parts per  
10 billion?

11 A. Yes, that is absolutely true.

12 Q. Did that actually occur at some of the sites  
13 that we are talking about?

14 A. It does. Some of the sites we had  
15 concentrations in the millions of parts per billion in  
16 groundwater.

17 Q. Now, one of the things that can happen with a  
18 chemical when it enters the soil is that it can stick  
19 to the soil. Correct?

20 A. Yes. Particularly, there are certain gasoline  
21 constituents that are essential bound to the soil  
22 particles. They absorb onto the organic carbon within  
23 the soil. So therefore their movement is retarded by  
24 that absorption.

25 Q. In other words, they don't move very far?

1 A. Correct. Particularly longer chain hydrocarbons  
2 -- I should point out, gasoline contains numerous  
3 constituents.

4 Q. More than?

5 A. On the order of 100, say, depending on the  
6 gasoline. But the majority of them are either long  
7 chain hydrocarbons or branched chain hydrocarbons.

8 MR. MILLER: I don't want to do a deep drive  
9 into chemistry today, your Honor. I'm going to avoid  
10 that.

11 A. (Continuing.) Crude oil contains hundreds of  
12 compounds. In each they vary in the number of carbon  
13 atoms in each compound, the number of hydrogen atoms,  
14 and how those atoms are structured. Hydrocarbons that  
15 have a large number of carbons, they absorb very  
16 readily to the soil material. So, therefore, they  
17 don't move very far at all.

18 Q. How does MTBE compare to those?

19 A. Well, compared to those, first, it's highly  
20 soluble, as we discussed, and, secondarily, it hardly  
21 absorbs to the soil particles at all. So,  
22 essentially, it moves through the subsurface with the  
23 groundwater and it's unretarded. That is, its  
24 movement is not restricted by natural processes as  
25 much as the gas of the gasoline constituents.

1 Q. Does it almost move at the same speed as the  
2 groundwater itself?

3 A. Pretty much, yes.

4 Q. Another characteristic that you list is that it  
5 doesn't volatilize from the groundwater. Why is that  
6 important?

7 A. So once a compound is dissolved into the  
8 groundwater, there is still the potential the compound  
9 could volatilize from the water. That's controlled by  
10 a chemical term called "the Henry's constant." And  
11 MTBE, once it's in the groundwater does not want to  
12 partition; that is, it doesn't want to volatilize from  
13 the groundwater. Whereas other constituents will  
14 partition from groundwater into the overlying vapor.  
15 Particularly, a concern here would be, say,  
16 chlorinated solvents, like dry cleaning solvents.

17 Q. Is MTBE persistent when it's dissolved into the  
18 groundwater?

19 A. Yes. Once it is in groundwater, its  
20 biodegradation rate; that is, how quickly it would be  
21 broken down by natural microbes. It's much lower than  
22 many of the other gasoline constituents.

23 One of the things that became apparent in the  
24 early-to-mid 1990s is that one of the other  
25 constituents of concern in gasoline is benzene, but it

1 was realized in studies in the early 1990s. Benzene  
2 actually biodegrades reasonably well. Therefore,  
3 there aren't many very large plumes of benzene.  
4 Whereas, because of its lack of biodegradation and its  
5 other properties, there is a much larger number of  
6 significant MTBE plumes from gasoline releases.

7 Q. Given the characteristics that we've discussed  
8 about MTBE, what does that tell us about how it will  
9 behave in the subsurface?

10 A. So as we discussed, the MTBE will dissolve into  
11 the groundwater. It will move with that groundwater  
12 pretty much at the rate of groundwater movement. It  
13 will be very poorly retarded, if at all. It will  
14 persist for a long time because its biodegradation  
15 rate is low.

16 So because of that generally MTBE plumes, when  
17 one compares it to other gasoline constituents, will  
18 be longer and larger, migrate much further and deeper,  
19 because as it moves away, it moves down also and  
20 persists longer.

21 Q. When we talk about persistence and persisting  
22 longer, could you give us some scale that we're  
23 talking about? Are we talking about years, decades,  
24 what?

25 A. Well, depending upon site-specific conditions,

1 it's at least decades. In some cases, it may run to  
2 more than a century.

3 Q. Let's turn to the next slide, please.

4 In setting your targets to be achieved, did  
5 you consider the groundwater quality standards that  
6 apply here in New Jersey?

7 A. Yes, I did.

8 Q. And could you explain what they are for MTBE and  
9 TBA, please.

10 A. As I mentioned earlier, there are essentially  
11 two types of standard. The first is the standard that  
12 applies to restoration, and that is the pre-discharge  
13 condition. That is, MTBE should not be there at all,  
14 but when limited by how low the labs can detect the  
15 compound, and that is what we referred to earlier as  
16 the PQL, the practical quantitation limit. So for  
17 MTBE and TBA, it's 1 part per billion for MTBE, and  
18 2 parts per billion for TBA.

19 Q. And in developing a remediation program, is that  
20 your target, the PQL?

21 A. That is correct, yes.

22 Q. And then in terms of the drinking water standard  
23 here in New Jersey.

24 A. So the other standard we discussed was at a  
25 federal level, we have what are called MCLs.

1           Now, in New Jersey we also have standards that  
2 they refer to as "groundwater quality standards."  
3 Those are 70 parts per billion for MTBE, and 100 parts  
4 per billion for TBA.

5       Q.     Now, in doing a typical gasoline cleanup, where  
6 the responsible party is trying to clean up for the  
7 site, which of those two goals are typically used?

8       A.     So for a remediation program that's being  
9 implemented by the responsible party, they are usually  
10 targeting the groundwater quality standards, that is,  
11 the higher concentrations.

12      Q.     70 for MTBE?

13      A.     That is correct.

14      Q.     And in this case did you take a look at getting  
15 the contamination down to restoration levels?

16      A.     Yes. My goal was to evaluate technologies or a  
17 combination of technologies that would eventually  
18 restore the groundwater to that pre-discharge  
19 condition, that is a target of the PQL.

20      Q.     Let's turn to the third step. This is basically  
21 a list of the types of information that you gathered.  
22 Is that correct?

23      A.     It's actually, one could describe it as, a  
24 series of substeps. So when one is evaluating the  
25 site-specific data, these are the steps one goes

1 through in completing that evaluation.

2 Q. So your attempt is to gather all of the  
3 appropriate site-specific documents. Is that correct?

4 A. Yes. That's the first step is pulling together  
5 the pertinent documents and data.

6 Q. Why is the site history and site investigation  
7 and remediation history also important for you?

8 A. It's important to know what is being done at the  
9 site both in terms of its general operational history  
10 where that information is available, as well as the  
11 history of investigation and remediation programs that  
12 may have been implemented at that site.

13 So we see from the first investigation after  
14 the current time, what has the responsible party been  
15 doing at the particular site.

16 Q. I'm going to move on to the next one without  
17 going through each of those items in detail.

18 I think, in general, at least, they have been  
19 conceptually discussed.

20 The next is a site conceptual model. Is that  
21 a tool that is used in your field, and why and how is  
22 it used?

23 A. Yes. This is a term that's used within the  
24 consulting industry when evaluating groundwater  
25 contaminant conditions. It essentially tries to

1 create a picture of the current conditions with  
2 respect to contamination and the projected conditions  
3 based upon the fate and transport of the  
4 contamination.

5 THE COURT: I don't have page 14 in my  
6 handout. I go from 13 to 15. Do you want to hand me  
7 up a 14.

8 (Pause.)

9 Q. You have some terms there that are not  
10 self-evident to me at least.

11 What is LNAPL listed as one of the sources  
12 that you evaluate?

13 A. "LNAPL" is an acronym that stands for "Light  
14 Non-Aqueous Phase Liquid."

15 Q. And as applied to gasoline, what does that mean?

16 A. That is essentially pure gasoline as it's  
17 present in the subsurface.

18 Q. Can you actually have a situation where you can  
19 measure gasoline in a monitoring well, gasoline  
20 itself?

21 A. Yes. In fact, at some of the sites that are the  
22 subject of this matter, there are actually monitoring  
23 wells that have been installed where the pure gasoline  
24 in the subsurface could be measured in the wells.  
25 There was so much gasoline it was accumulating in the

1 wells.

2 Q. Why would that happen?

3 A. Essentially, the release had been large enough  
4 that not all of the constituents could either absorb  
5 to the soil particles or dissolve into groundwater.  
6 So, therefore, there was still pure gasoline present  
7 in the subsurface.

8 Q. I take it, that's an indication of a larger  
9 release?

10 A. Yes. That would be an indication of a very  
11 significant release.

12 Q. Could you actually measure LNAPL or this pure  
13 gasoline in feet in a monitoring well at some of the  
14 sites?

15 A. Yes. At some of the sites it's accumulated in  
16 multiples of feet, and I've worked on sites where  
17 there have been over 10 feet of gasoline accumulated  
18 in wells.

19 THE COURT: Are you speaking generally or  
20 particularly as to any of the sites here?

21 THE WITNESS: In certain sites there was  
22 gasoline observed in wells, and it was measured in  
23 feet. But I was saying a site that I have worked on,  
24 not in this matter, I've actually seen gasoline of  
25 over 10 feet in a well.

1 BY MR. MILLER:

2 Q. What happens to that gasoline over time that's  
3 floating on top of the groundwater?

4 A. Essentially, two things happen.

5 First, obviously, the gasoline is spreading  
6 out on top of the groundwater surface. So it's often  
7 depicted as sort of a pancake, or the syrup on top of  
8 a pancake might be a better analogy. It's a little  
9 more complicated than that because it's mixing in a  
10 multiphase environment. So it's part gasoline and  
11 part water.

12 The second thing is the gasoline, as it's in  
13 contact with the water, the constituents in the  
14 gasoline are dissolving into the water.

15 Q. So, eventually, would the LNAPL be expected to  
16 disappear if you cut off the continuous release of  
17 gasoline at a site?

18 A. Yes. If, say, for example, it had come from a  
19 leaking tank, if the leak had been stopped and the  
20 tank replaced, now we have a finite volume of gasoline  
21 within the subsurface, and eventually that gasoline or  
22 the MTBE in that gasoline all of it would eventually  
23 dissolve into groundwater.

24 Now, that may take many, many, many years if  
25 not decades. Therefore, many of the sites, including

1 some of those that are the subject of this litigation,  
2 the responsible party implements programs to try and  
3 recover that LNAPL, that pure gasoline.

4 MR. MILLER: Your Honor, I don't mind being  
5 interrupted with questions at all if you have any.

6 THE COURT: Even if you did, I would. Take  
7 that as it is.

8 MR. MILLER: Those guys over there sometimes  
9 interrupt me, too.

10 Q. So if we have gasoline released from an  
11 underground storage tank, how deep in the subsurface  
12 is the tank?

13 A. Generally, the bottom of the tank at most of the  
14 gasoline sites, underground storage tanks, gas  
15 stations, I would say vary from about 12 to 15 feet  
16 below ground surface.

17 Q. In some of the settings here in New Jersey  
18 you've investigated and will testify about this  
19 morning, how deep is the groundwater?

20 A. In some cases the groundwater is at a similar  
21 depth. So the tank is often literally sitting in  
22 groundwater. So when a release occurs, it goes  
23 straight into the groundwater.

24 Q. Now, in the conceptual model, the next factor  
25 that you evaluate is the "pathway." What do you mean

1 by that?

2 A. Essentially, we're evaluating where the  
3 contamination will move. So in this case we are  
4 looking at particularly groundwater transport. So we  
5 know where it's being released. We have an  
6 understanding where it's present. Where will it move  
7 to? What is the pathway it uses to migrate.

8 Q. And the receptors you've discussed earlier, that  
9 would include wells, bodies of water, et cetera.  
10 Correct?

11 A. That's correct. So we want to know where they  
12 are, what are they used for, how might they be  
13 exposed, and what treatment might be required if they  
14 are exposed.

15 Q. Can a person in your field predict where the  
16 gasoline is flowing away from the site, if it's  
17 reached the subsurface?

18 A. Yes. That's one of the things we try to do as  
19 part of that site conception model in evaluating the  
20 fate and transport of the contaminant. So we look at  
21 the contaminant's properties and in this case the  
22 hydrogeologic conditions, and the groundwater flow,  
23 and, say, based on that, where would we anticipate the  
24 contamination would move to?

25 Q. In this case, did you literally evaluate a site,

1 predict where the gasoline was going, and install a  
2 monitoring well to determine if it had reached a  
3 location away from the station it was in the direction  
4 you predicted the MTBE would move?

5 A. Actually, yes. As part of this matter, we did  
6 that at several sites. But more recently we did it at  
7 one particular site where I had evaluated where I  
8 believe the contamination had migrated to, and we  
9 installed monitoring wells in that location and  
10 identified very high concentrations of MTBE.

11 Q. Was that the first time anyone had identified  
12 contamination in the area you just described?

13 A. It is, yes. The responsible party had not  
14 conducted an investigation in that area.

15 Q. So you were able to accurately predict where it  
16 was going. Is that correct?

17 A. Correct.

18 MR. LENDER: Your Honor, it would be helpful  
19 to know which site we are talking about.

20 THE COURT: I was going to ask that myself.

21 Q. Mr. Brown, you have a question. It didn't come  
22 from me.

23 A. The sites we're discussing today or the subject  
24 of today's hearing, that site would be the Getty West  
25 Windsor site.

1 THE COURT: Which actually is not being  
2 discussed today.

3 MR. MILLER: Correct.

4 THE COURT: We understand the work that you  
5 did. So your responses should be limited to the sites  
6 that are the subject of the inquiry today, the  
7 Livingston site, and the other site, the Cumberland  
8 Farms is involved in, Bakers Waldwick.

9 So the question you just answered with regard  
10 to installing with monitoring wells and determining  
11 MTBE had flowed there, and it was not been discovered  
12 by the responsible party, the site you identified is  
13 not the Livingston or the Bakers Waldwick site.  
14 Correct?

15 THE WITNESS: That is correct. The site we  
16 were just discussing was the Getty West Windsor site.

17 THE COURT: So we'll put that aside.

18 MR. MILLER: Yes, your Honor.

19 BY MR. MILLER:

20 Q. Could we go to the next slide, please.

21 We talked a lot about contamination in  
22 groundwater. The technical term is "plume." Most  
23 people are familiar with it. Could you use this  
24 illustration to explain how groundwater plumes move  
25 and how you can predict their movement?

1 A. Certainly, yes.

2 Here we have a depiction from the published  
3 literature that shows a typical MTBE plume, and MTBE  
4 in the words of Monty Python would that beautiful  
5 plumage, and the plume essentially would migrate from  
6 the gasoline release area at the service station in  
7 the groundwater in the direction of groundwater flow  
8 and would eventually in this case reach a surface  
9 water body which is a stream.

10 They have also depicted some wells, but these  
11 are actually remediation wells. One could also  
12 imagine if there was a drinking water well in a  
13 similar location, that well would also be impacted.

14 Q. You can also use wells to intercept and remove  
15 contamination from the subsurface. Correct?

16 A. That's correct. In this case, the depiction  
17 shows what they are referring to as oxygen injection  
18 wells where they are injecting oxygen to promote the  
19 degradation and oxidation of the plume. This could  
20 also be a capture well where one was pumping the water  
21 to capture the MTBE plume. That's done in the process  
22 called pump and treat.

23 Q. In this case, you show that the water table has  
24 a slope that's toward the stream. Correct?

25 A. That's correct. You may recall I mentioned

1 earlier in the course of this testimony how, in  
2 general, groundwater moves towards points of  
3 discharge. In this case, the point of discharge is a  
4 stream. Now, the point of discharge could also be a  
5 water supply well that had that cone or depression we  
6 talked about. So the water moves from the release  
7 towards the point of discharge.

8 Q. What does the term "water table" refer to? I  
9 don't think we've used that before.

10 A. You may recall, we talked about measuring the  
11 head, the evaluation of the groundwater in monitoring  
12 wells, and then we contour that surface just as if we  
13 were contouring a hill, and essentially that surface  
14 is referred to as a water table. So below the water  
15 table, in this case, the sediments are saturated  
16 completely with water. That's the groundwater zone.  
17 Above that is the vadose zone.

18 Q. If the slope is steeper, how does that affect  
19 the groundwater flow or movement?

20 A. So if the slope of the water table of the  
21 general groundwater surface is steeper than the  
22 velocity of the groundwater, movement is increased.

23 Q. Are there actually mathematical formulas used in  
24 your field, taking advantage of the information about  
25 the slope of the groundwater, that enables you to

1 predict the speed of groundwater throw?

2 A. Yes. One can use an equation that was developed  
3 by a gentleman called Darcy. Henri Darcy, he was a  
4 French engineer. He was the city engineer for the  
5 city of Dijon in the 19th Century, and he developed a  
6 mathematical formula to calculate the flow of  
7 groundwater, and from that formula you can calculate  
8 the velocity of the groundwater.

9 Q. That formula has been used for more than  
10 100 years by people in your field?

11 A. It is. It's probably the most widely used  
12 formula in the groundwater profession.

13 Q. Let's go to the next slide.

14 This is a more complicated setting. Correct?

15 A. Yes. The previous slide showed a gasoline  
16 release and an MTBE plume within unconsolidated  
17 sediments, so in this case a sand aquifer. This slide  
18 shows a gasoline release into fractured bedrock.

19 Q. There are various red lines shown. Is that  
20 intended to represent -- if you look at the top there  
21 is an underground storage tank abbreviated UST, and  
22 there appears to be a fluid or something in red piling  
23 up. What are we talking about there?

24 A. This is the underground tank. The gas station  
25 had a leak. The gasoline is leaking from the

1 underground storage tank. It's collecting in the  
2 bottom of the tank pit, and it's entering a fracture  
3 intercepted by the tank pit, and the gasoline is  
4 penetrating into that fracture and then moving into  
5 interconnected fractures.

6 We can see in this case, rather than really a  
7 broad pancake or syrup of MTBE on top of a pancake in  
8 an unconsolidated sediment, here we have linear  
9 features of gasoline within the fracture network.

10 Q. If we look at the left portion of the diagram,  
11 there is something that appears to be similar to a  
12 well that has red in it. Could you explain, please.

13 A. Certainly, yes. So this picture is showing  
14 three wells completed in close proximity. One of the  
15 wells has red in it, which is an accumulation of  
16 gasoline. This well has gasoline because it  
17 intercepts a fracture that contains gasoline, whereas  
18 the other well right next to it completed at a very  
19 similar depth does not intercept the gasoline  
20 containing fracture; therefore, it only contains  
21 groundwater and no gasoline. So we can see it's a  
22 very complex distribution of the gasoline within the  
23 fractures as compared to the distribution in  
24 unconsolidated sediments.

25 Q. Apart from the graphic, in the real world could

1 you literally have wells close together in a fractured  
2 rock environment where one is contaminated and the  
3 other one appears to be clean?

4 A. Yes. I actually have worked on projects where  
5 wells within a few feet, in fact, had one well with an  
6 accumulation of multiple feet of gasoline and the well  
7 right next to it has no gasoline whatsoever.

8 Q. Can that same complexity make it more difficult  
9 to clean up MTBE that has entered into a fractured  
10 rock environment, when compared to the other  
11 environment we were discussing, which is the  
12 unconsolidated materials laid down over time by  
13 streams and rivers and that kind of thing?

14 A. Yes. Clearly, because of its distribution and  
15 where it is located, it is much more difficult to  
16 remediate and restore this aquifer zone.

17 Say, for example, in unconsolidated aquifers,  
18 one might evaluate the use of an in-situ technology.  
19 That is a technology that cleans up the contamination  
20 in place. We had on that previous slide an in-situ  
21 approach using oxygen, somehow introducing oxygen to  
22 the subsurface. The issue with in-situ technologies  
23 is, how do you get the oxygen to the contamination?

24 In an unconsolidated aquifer that is still  
25 quite complicated, but in a fractured rock aquifer

1 that is extremely difficult to do.

2 Q. In other words, you can drill two wells that are  
3 designed to intercept and clean up MTBE next to each  
4 other and only one of them might turn out to be able  
5 to be used for that purpose because only one of them  
6 might intercept the MTBE?

7 A. That is correct. Even in unconsolidated  
8 settlements that can actually occur. I had worked on  
9 a project with Mobil where we had two wells within ten  
10 feet. One had tens of thousands of parts per billion,  
11 and the other had just a few hundred. So even in  
12 unconsolidated settlements, the distribution of the  
13 contamination is completion, but in fractured rock  
14 settings it's extremely complex.

15 Q. Can you have a situation where the well is  
16 contaminated today in fractured rock, and you come  
17 back two years later and it's not present, and you  
18 come back later than that and it is?

19 A. That can occur. That's not as common because  
20 those fractures are interconnected.

21 Let's say you implemented a product recovery  
22 program at that well, you actually somehow went in and  
23 sucked the pure gasoline out, and after a period of  
24 time you realize, Oh, we cleaned up that gasoline, the  
25 well doesn't contain gasoline now, you might come back

1 a few months later and the gasoline has reaccumulated.  
2 It's just taking time to move through the fractures  
3 and reaccumulate in the well.

4 Q. Does that have implications about your  
5 recommendations at MTBE sites in this case?

6 A. That's one of the key factors we would consider  
7 in determining what would be an appropriate  
8 site-specific restoration program.

9 Q. Let's go to the next slide, please.

10 These are steps to achieve a restoration  
11 program, which you explained earlier, is getting down  
12 to 1 part per billion for MTBE or below so that it can  
13 no longer be detected. Correct?

14 A. That is correct. That is the first subset  
15 within the restoration. What is your goal?

16 Q. In this case, how does that apply?

17 A. So with respect to the stations that are the  
18 subject of this matter, one would evaluate  
19 technologies that would allow you to restore the  
20 aquifer to that standard or a combination of  
21 technologies.

22 Q. In evaluating the feasibility of restoration  
23 approaches, does the setting matter?

24 A. It does, yes. So one has to consider  
25 site-specific conditions because one technology may

1 work at one site but not at another. In some cases,  
2 we have technologies that are more widely applicable  
3 such as pump and treat, which could be applied to many  
4 if not all of the sites.

5 Q. So basically it's not a one size fits all  
6 approach. Is that correct?

7 A. That's correct. And even if the technology is  
8 applicable to multiple sites, how it's supplied is  
9 different and specific for each site. So the number  
10 of recovery wells, the pumping rate, how it will be  
11 treated, those are all site-specific conditions even  
12 if the same technology is applied.

13 Q. And you used that site-specific analysis in your  
14 recommendations in this case for restoration?

15 A. Yes, we did.

16 Q. Now, you indicate that in selecting the  
17 technology at an individual site, it matters whether  
18 or not the contamination in point number 4 is in the  
19 vadose zone or soil versus the groundwater on an  
20 off-site and drinking water. Why is that?

21 A. When one is considering where the contamination  
22 is, the technology or the approach one takes to  
23 remediation or restoration will vary. Therefore,  
24 cleaning up the vadose zone -- that is the area above  
25 groundwater, it would be a different technology than

1 if we were cleaning up groundwater.

2 Now, if we're cleaning up on-site groundwater  
3 as compared to off-site groundwater, again, it might  
4 be a different technology. If we were cleaning up an  
5 impacted drinking water well, the technology might be  
6 somewhat similar, but now we're dealing with a  
7 different type of groundwater condition where we might  
8 have a well with very high flow conditions.

9 Q. The last step is estimating the cost. We are  
10 not going to be spending any time on that today, I  
11 believe. I don't think that's really the focus of the  
12 motion. So let's go to the next slide, please.

13 You indicated eight technologies were  
14 evaluated, and you list them on this slide. What is  
15 "monitored natural attenuation"? I think "no action"  
16 is self-explanatory.

17 A. So "monitored natural attenuation" is an  
18 approach that is taken to address groundwater  
19 contamination. So once a chemical is in the  
20 groundwater, there are processes that occur that can  
21 retard that contamination's movement and also  
22 processes that can in fact slowly degrade or address  
23 the contamination. Those processes collectively are  
24 referred to as "natural attenuation."

25 Now, to evaluate whether that's going on, you

1 have to actually monitor the conditions.

2 Q. What does it mean to "monitor"?

3 A. One has to actually measure the groundwater in  
4 monitoring wells and take samples from those wells,  
5 have them analyzed to evaluate whether the natural  
6 attenuation processes are in fact restoring the  
7 groundwater in a reasonable period of time.

8 Q. So I take it monitored natural attenuation would  
9 be different than relying on natural attenuation  
10 without monitoring?

11 A. Well, it's hard to rely if you are not  
12 monitoring it. You do not know if it's happening.  
13 You have to monitor it to know if it's happening or  
14 not.

15 Q. Is it important to do the monitoring?

16 A. Yes, it's very important. One needs to know  
17 whether the natural attenuation processes are in fact  
18 sufficient to address the contamination and restore  
19 the aquifer.

20 Q. Are there sites in this case where you  
21 recommended monitored natural attenuation at some  
22 point in the process?

23 A. Yes. I believe, actually, at all of the sites.  
24 We recommended at some point as part of the  
25 restoration program we would move to a monitored

1 natural attenuation approach.

2 Q. Was that at the beginning of the process or  
3 toward the end or what?

4 A. It's essentially toward the end. So one would  
5 implement some other form of restoration to reduce  
6 contaminant concentrations to a point at which you  
7 believe monitored natural contamination could address  
8 the residual lower contaminations.

9 Q. And typically at these sites, where was that  
10 point where you thought you could transition from what  
11 I'm going to call active remediation or cleanup to  
12 monitored natural attenuation?

13 A. We indicated that we felt the appropriate point  
14 would be once one reached the groundwater quality  
15 standard -- that is, 70 parts per billion for MTBE,  
16 one could transition from active remediation or active  
17 restoration to monitored natural attenuation.

18 Q. Why did you select that level?

19 A. Based upon the work I've done at hundreds of  
20 sites, we often find there is a concentration of which  
21 active remediation would be no quicker addressing the  
22 low concentrations than just letting natural  
23 attenuation. So one doesn't know exactly what that  
24 level might be, but we often find it's some multiple  
25 of the restoration goal. And in looking at the

1 information for many of the sites, we felt an  
2 appropriate number would be a groundwater quality  
3 standard.

4 Q. The third technology you have evaluated was  
5 "enhanced biodegradation." We talked earlier about  
6 injecting oxygen. Is that an example?

7 A. Yes. That's the most common approach taken to  
8 enhance biodegradation.

9 Q. Why would injecting oxygen enhance  
10 biodegradation?

11 A. Biodegradation in the subsurface occurs in two  
12 types of ways.

13 One is aerobic; that is, degradation by  
14 bacteria that like oxygen rich environments; and  
15 anaerobic, which is a degradation by the  
16 microorganisms that prefer low oxygen environments.

17 Q. Which of the two tends to be faster in  
18 degrading?

19 A. So with respect to MTBE, one would prefer to see  
20 aerobic conditions. Now, for certain other  
21 constituents, you are actually better off with  
22 anaerobic conditions. So, for example, many of the  
23 chlorinated solvents that are released to the  
24 environment or the bacteria that degrade them prefer  
25 anaerobic conditions.

1 Q. So literally by injecting oxygen you could make  
2 in an oxygenated environment that wouldn't exist in  
3 nature that enhances the biodegradation of MTBE.

4 Correct?

5 A. That's correct, yes. That's the intent behind  
6 many of those oxygen injection programs.

7 Q. Now, "soil vapor extraction," it applies to the  
8 vadose zone or unsaturated area because you are  
9 calling it soil?

10 A. Yes. This is a technology that's used to treat  
11 contamination in the vadose zone. That's above  
12 groundwater, floating on top of the groundwater, or  
13 also slightly mixed with that capillary fringe. Here  
14 we are relying on the natural volatility of the  
15 contaminant to partition into the vapor; that is, it  
16 moves from the gasoline and becomes a vapor within the  
17 pore space, and you essentially suck it out.

18 Q. Is that effective if the contamination is in the  
19 soil zone?

20 A. If it's in the soil and the contaminant is  
21 volatile in its pure phase, and the soil is relatively  
22 permeable, soil vapor extraction is extremely well.

23 Q. Basically, is the goal to remove massive  
24 contaminant from the subsurface?

25 A. Yes. Essentially, the contamination that's

1 still present in the soil or present as LNAPL, is  
2 what's referred to as a secondary source. It sits  
3 there and continues to contaminate groundwater.  
4 Therefore, the technology like soil vapor extraction  
5 is used to reduce that secondary source.

6 Q. Another technology you considered was in-situ  
7 air sparging. Could you describe that for us, please.

8 A. In-situ air sparging is a process by which air  
9 or, in some cases, oxygen are injected below the  
10 groundwater table. They accomplish two things.

11 First, they can create a more aerobic  
12 environment, and the second, the physical injection of  
13 the air can partition or strip some of the dissolved  
14 constituents from the groundwater and move them into  
15 the vapor phase in the vadose zone where they can then  
16 be withdrawn by soil vapor extraction.

17 Q. What is "multiphase's extraction," briefly?

18 A. So this is essentially combining soil vapor  
19 extraction with the extraction of LNAPL, if it's  
20 accumulating in wells, and the extraction of very high  
21 concentrations of MTBE that are dissolved in the  
22 groundwater at the site itself.

23 So it's widely used at the release site to not  
24 only get rid of contamination within the vadose zone,  
25 but also recover LNAPL and the very high

1 concentrations of MTBE in the groundwater.

2 Q. So multiphase literally captures vapor and  
3 water?

4 A. It's capturing in many cases vapor, pure  
5 gasoline, and water.

6 Q. What is "in-situ chemical oxidation"?

7 A. In this case, this technology not only injects  
8 oxygen to enhance aerobic conditions, but you inject  
9 an actual chemical at very high dosages to promote the  
10 physical oxidation of the contaminant. That is, a  
11 chemical reaction will occur that eventually breaks  
12 the contaminant down ultimately to carbon dioxide and  
13 water.

14 Q. So it's a chemical attacks chemical process?

15 A. Essentially, yes. You are injecting some  
16 oxidative compound, like hydrogen peroxide or fenton  
17 reagent to promote a physical reaction in the  
18 subsurface.

19 Q. The last technology listed is "pump and treat"?

20 A. Yes. So pump and treat, we mentioned that  
21 earlier, this is where one puts in a pumping well  
22 that's specifically designed to intercept the plume,  
23 or it could be multiple wells that are pumped at a  
24 defined pumping rate to capture the contamination.  
25 You essentially pump it to pull in the contamination;

1 and then once it's pumped from the well, you treat it  
2 with some type of above-ground technology.

3 MR. MILLER: Your Honor, I'm about to shift to  
4 the two sites.

5 THE COURT: Off the record.

6 (Off-the-record discussion.)

7 BY MR. MILLER:

8 Q. Let's turn to the Exxon Livingston site first,  
9 please. That's Plaintiff's Exhibit 4. We've marked  
10 the PowerPoint into three sections, 3, 4, and 5.

11 This is a description of some basic details  
12 about the Exxon Livingston site which is in a township  
13 in New Jersey. Correct?

14 A. That's correct.

15 On this figure to the left we could see an  
16 insert map which shows the State of New Jersey, and  
17 the yellow star would be the approximate location of  
18 this particular site.

19 Q. It's been a gas station since 1934, but MTBE  
20 wasn't a gasoline in 1934. Is that your  
21 understanding?

22 A. That's my understanding, yes.

23 Q. Back here on the East Coast, when was MTBE  
24 introduced in the gasoline, approximately?

25 A. It varies, depending on location and oil

1 company, but I have seen examples where MTBE was added  
2 to gasoline in the late 1970s. It was not added as an  
3 oxygenate. It was simply added as an octane  
4 enhancement to improve the combustion of the gasoline.  
5 So it was added at much lower percentages.

6 Q. So if you add oxygen to gasoline, it literally  
7 raised the octane level that we are familiar with at  
8 the pump?

9 A. That's correct. It allows the gasoline to burn  
10 more efficiently.

11 Q. In that particular case, Exxon Livingston, have  
12 they installed approximately 40 monitoring wells?

13 A. That is correct, yes.

14 Q. And those monitoring wells are used to gather  
15 measurements of various chemicals, including MTBE?

16 A. Yes. They have a chemistry data set that  
17 extends over 15 years. So they have been sampling the  
18 wells for over 15 years, and having those samples  
19 analyzed for gasoline constituents including MTBE.

20 Q. Did you evaluate the 15 years of chemistry data  
21 particularly as it applies to MTBE?

22 A. Yes, we did.

23 Q. And in terms of the extent of the documents you  
24 had on file, what is the size of the file, please?

25 A. With respect to this particular site, we

1 reviewed over 11,000 documents.

2 Q. Let's go to the next slide, please.

3 There are some dots shown over an aerial  
4 photograph of the area. What do the dots represent?

5 A. So this figure is actually taken directly from  
6 my expert report. This is the service station in the  
7 area where we see the majority of the dots. This is  
8 the Exxon Livingston site. This is Livingston Avenue  
9 at Mount Pleasant, the main intersection here, and the  
10 dots -- most of them are approximate to the site or  
11 just to the west of the site, but there are also dots  
12 that extend about a third of a mile to the west of the  
13 site. These are monitoring wells that have been  
14 installed by ExxonMobil.

15 Q. And is a public drinking water supply well also  
16 depicted?

17 A. Yes. There are actually two supply wells  
18 depicted on here. This is Livingston Supply Well 11,  
19 which is about a third of a mile to the west of the  
20 Exxon Livingston site, and there is also a commercial  
21 well for a liquor store that's to the southwest of the  
22 ExxonMobil site.

23 Q. Are we talking about an unconsolidated deposit  
24 environment, a fractured bedrock environment, or what?

25 A. So for this particular site we have a thin

1 veneer of unconsolidated sentiments, not so thin,  
2 30 feet or so; and below that we have bedrock. So we  
3 are addressing contamination both within  
4 unconsolidated sediments and in the bedrock itself.

5 Q. So if we take the public drinking water supply  
6 well, Livingston 11, is that actually completed in  
7 drawing water from bedrock?

8 A. If I move down a few slides. We go to this  
9 slide here.

10 Q. Is this kind of a map of the subsurface?

11 A. Yes. First, let's look at this figure here,  
12 which is the map we just looked at, and it has two red  
13 lines on it. These lines depict where we are going to  
14 show cross-sections. These are vertical slices of the  
15 subsurface, and the cross-sections depict the  
16 geographic conditions that were mapped in the drilling  
17 of the wells. So we're going to look at cross-section  
18 A prime that runs across the Exxon Livingston site to  
19 the northwest, and then to the public water supply  
20 well, Livingston Well No. 11.

21 Q. Where did you get the data to do the  
22 cross-sections from?

23 A. The data is collected by the consultants who  
24 drill and install the monitoring wells or the drilling  
25 company that installed the public supply well. When a

1 consultant is retained, in this case for the majority  
2 of the wells, by ExxonMobil, when they drill the bore  
3 hole, that's the physical hole they drill into the  
4 subsurface within which they will install a well, they  
5 take samples of soil and rock they encounter, and they  
6 describe that on what's called a boring rock. And, as  
7 my family says, yes, your job is pretty boring.

8 Q. So let's look at the cross-section that's along  
9 that line you have shown us that goes all the way to  
10 Well 11.

11 A. Yes. It's difficult to read the particulars on  
12 this. This is taken from my expert report. This area  
13 here is the Exxon Livingston site. We've marked the  
14 site. The cross-section runs from just east of the  
15 site all the way to Public Water Supply 11. It shows  
16 the type of geology that was detected when the  
17 monitoring wells were drilled as depicted by the  
18 consultants working for ExxonMobil.

19 Q. I see Zone A, as an example, the shallowest of  
20 the labeled zones toward the bottom of the figure that  
21 we have, and it extends all the way from the  
22 ExxonMobil site to the well. Correct?

23 A. That is correct. So when they investigated the  
24 site, ExxonMobil's consultants first identified the  
25 unconsolidated sediments that ranged from about 20 to

1 50 feet thick, depending on where you are; and at that  
2 point they entered the bedrock, and they classified  
3 the different layers of the bedrock, which is referred  
4 to as strata, those different layers, and they labeled  
5 them by A, B, C and D descending with depth beneath  
6 the ExxonMobil station. So the shallowest bedrock  
7 zone they referred to as Zone A, and then it went B, C  
8 and D. So these are the different bedrock layers.

9 So the consultants evaluating the bedrock felt  
10 there were differences within the samples that allowed  
11 them to basically develop this layered model for the  
12 bedrock.

13 Q. Do you agree with them in the way they defined  
14 those zones?

15 A. Yes. They have done a reasonably good job of  
16 characterizing the bedrock.

17 Q. Okay.

18 A. Now, as they advance more wells to the west of  
19 the station, they realized, because of the natural  
20 dip, that is, the slope of the bedrock layers, there  
21 was actually a bedrock zone above A, and they just  
22 referred to that as Zone Z.

23 Q. Why would the bedrock dip in this way? Is there  
24 a brief way to understand that?

25 A. Without getting into a complex geologic

1 discussion, over time, historically, the layers may  
2 have been deposited flat horizontally, and then over  
3 time, because of the natural forces in the subsurface  
4 over millions of years, the layers can become bent or  
5 tipped; they can also become faulted and offset. So  
6 that's referred to as the dip. That's the slope of  
7 those layers that has changed over time, and the slope  
8 that is now present.

9 This slide, slide 3 of the set shows the  
10 regional geologic conditions. So here we have the  
11 natural geologic conditions regionally in the area of  
12 Livingston, and we can see that same dip that occurs  
13 to the west within the geologic strata.

14 Q. If we go back to your cross-section, did MTBE  
15 make its way from the Exxon station all the way to  
16 City Well 11 to the city of Livingston?

17 A. Yes, it did.

18 Q. It was detected in the well more than once?

19 A. Yes. There was a period of time MTBE was  
20 detected in the well, but in the recent sampling over  
21 the last few years no MTBE has been detected in Supply  
22 Well 11.

23 Q. Did you, in evaluating this site, evaluate  
24 whether there was some other MTBE source in the area  
25 besides the Exxon station in Livingston at 38 East

1 Mount Pleasant Avenue?

2 A. Yes. We actually looked at data for two other  
3 service stations within this area. One I remember was  
4 a Texaco station. I can't remember the branding of  
5 the second station. But we evaluated the contaminant  
6 and groundwater conditions at those two stations to  
7 determine whether they might have contributed to the  
8 MTBE detected at Livingston Supply Well 11.

9 Q. Did you also evaluate the nearest receptors or  
10 wells in doing your analysis for this site?

11 A. Yes, we did. Obviously, we discussed Water  
12 Supply Well 11. There are also a series of other  
13 water supply wells proximate to the Exxon Livingston  
14 site.

15 This figure, again, is taken from the expert  
16 report. The yellow star here is the Exxon Livingston  
17 site. Then we have Public Water Supply Well 11. We  
18 have other water supply wells that are proximate. The  
19 one of real concern is Water Supply Well 11. But we  
20 also identified a commercial well at the Bottle Stop  
21 Liquor Store.

22 Q. What is the distance between the Exxon  
23 Livingston site that released MTBE in gasoline and  
24 Well 11?

25 A. We indicated here on this slide it's 1700 feet.

1 So about a third of a mile.

2 Q. Did you also compile a site chronology?

3 A. We did, yes. We reviewed all of the  
4 documentation for this site and prepared a brief  
5 chronology both in text format, which ran many, many  
6 pages, of all of the actions that occurred at this  
7 site, particularly the investigation and remediation  
8 actions, and then we also prepared a bar graph to show  
9 those actions over time.

10 Q. Did Exxon actively remediate the site?

11 A. Yes, they did.

12 Q. Did they do that in general before or after they  
13 learned that MTBE was in City Well 11?

14 A. The majority of the remedial actions that have  
15 been implemented occurred after the discovery of MTBE  
16 in Water Supply Well 11.

17 Q. If you do remediation back at the site after  
18 it's been detected in a well a mile away, does that  
19 help over time?

20 A. Yes, it will. You are removing the source of  
21 the contamination, the secondary source we talked  
22 about. So one is limiting the amount of contamination  
23 that could ultimately over time impact groundwater.

24 Q. You mentioned the MTBE detections in City Well  
25 11 went away over time. What do you attribute that

1 to?

2 A. I think the key factor would be the complexity  
3 of the hydrogeology. Well 11 pumps water from  
4 fractured bedrock. So there may be a period of time  
5 there was some contamination, a defined fracture that  
6 was intercepted by that well. But over time that MTBE  
7 was no longer present in that fracture and hasn't been  
8 seen since then.

9 Q. Does that rule out the possibility that over  
10 time some other fracture may contribute MTBE to the  
11 well?

12 A. No, it does not. The continued migration of the  
13 plume could ultimately impact the well at a subsequent  
14 time.

15 Q. Now, did you make recommendations concerning  
16 this site?

17 A. Yes, I did.

18 Q. In understanding your recommendations, the first  
19 thing we need to discuss is groundwater flow?

20 A. Yes. You may recall part of the standard  
21 methodology I use and other consultants use in  
22 evaluating these contaminated release sites, we do a  
23 site-specific analysis, and one of the steps is to  
24 evaluate the hydrogeology and groundwater flow  
25 conditions. How deep is the groundwater? Which

1 layers, which strata is the groundwater present in?

2 And which direction does the groundwater flow within  
3 those layers?

4 Q. At this site, the direction of groundwater flow  
5 literally changes depending on what area in the  
6 subsurface you are talking about. Is that correct?

7 A. That is correct, yes.

8 Q. Can you explain that, please?

9 A. Certainly, yes.

10 So ExxonMobil, as part of their investigation  
11 program, has installed wells at various depths. They  
12 are installed in different layers, different strata.  
13 Some of the wells go into the unconsolidated  
14 sediments; others are screened within defined bedrock  
15 layers. And in quite a few locations, they have  
16 installed multiple wells at a single location. These  
17 are often referred to as cluster wells. So you have  
18 multiple wells, and they are completed at different  
19 depths. That allows us then to monitor the water  
20 level in those wells that's specific to an individual  
21 layer and determining the groundwater flow direction  
22 in that layer.

23 Q. So what are the directions of the flow in the  
24 subsurface that vary?

25 A. Certainly, yes.

1           So based on the data that has been collected  
2 by ExxonMobil in the monitoring wells that they have  
3 installed, within the unconsolidated sediments the  
4 predominant groundwater flow direction is to the  
5 southwest. Now, one has to understand, there is  
6 always some variation. Groundwater flow changes with  
7 time to some degree.

8 Q.       Does it change by season, for example?

9 A.       By season. It can change in response to well  
10 pumping. But, In general, for the unconsolidated  
11 zone, the flow is to the southwest.

12 Q.       Okay.

13 A.       Now, when we look at the conditions within the  
14 bedrock, the wells that are completed in Zone B, that  
15 is the second bedrock layer beneath the Exxon station,  
16 the flow direction is also predominantly to the  
17 southwest. We know, for example, that's the direction  
18 towards the commercial water supply well that was  
19 impacted.

20 Q.       Well 11?

21 A.       No, the commercial well I'm talking about to the  
22 southwest.

23           Now, if we look at wells that are completed in  
24 Zone C, the layer below that, the water levels in that  
25 zone indicate a flow direction actually to the

1 northwest or west-northwest. So it's almost  
2 90 degrees off from the flow direction in the layer  
3 above.

4 Q. And if we go to the northwest, we encounter City  
5 Well 11?

6 A. Correct. That's the direction which we would  
7 find City Well 11.

8 Q. Could we go back to the map where you show the  
9 location of the commercial well, please.

10 A. Yes. So this is the Exxon Livingston site.  
11 This is the commercial well southwest of the site.  
12 And this is the municipal water supply well to the  
13 west-northwest of the site.

14 Q. Does City Well 11 intercept the C zone where  
15 movement is to the northwest?

16 A. Yes. It actually intercepts all of the zones  
17 that have been characterized as part of the  
18 investigation by ExxonMobil.

19 So bedrock Zone Z, A, B, C, and D because they  
20 all dip to the west, but the public water supply well  
21 is very deep, so it intercepts all of the different  
22 bedrock zones that have been characterized by  
23 ExxonMobil.

24 Q. Can we turn to your slide 9 in this subset  
25 concerning the site where you characterize the

1 contamination.

2 Historically, what was the maximum  
3 contamination of MTBE found at the Exxon Livingston  
4 site?

5 A. So the next step after we've evaluated  
6 groundwater flow conditions is, What are the  
7 contaminant conditions? So where is it? What's the  
8 extent? What's the magnitude?

9 When we summarize some of the magnitude  
10 information in this particular slide, where we have  
11 the three particular contaminants of concern, MTBE,  
12 TBA, and benzene, the first detected concentrations --  
13 that is, when they first sampled wells at the site,  
14 what was the concentration? And the maximum  
15 concentrations detected over the entire 15-year  
16 record, which is now almost 17 years, and then the  
17 maximum in the most recent sample we had at the end of  
18 2016, that was documented in my 2017 expert report.

19 So the maximum MTBE detected in a monitoring  
20 well related to the ExxonMobil site was 234,000 parts  
21 per billion, and this was in a sample taken from  
22 Monitoring Well 1, which is at the Exxon station taken  
23 in July of 2003.

24 Q. Is it located in the station somewhat near the  
25 underground storage tanks?

1 A. Relatively close, yes. This is close to where  
2 the release occurred.

3 Q. Today's most recent concentration that you give  
4 from your 2017 report is 74 parts per billion and  
5 change?

6 A. Correct. The most recent sampling in December  
7 of 2016, the highest MTBE detected in any of the  
8 samples collected by ExxonMobil was 74.3 parts per  
9 billion.

10 Q. And what do you attribute that decline to?

11 A. It's attributed to the active remediation that  
12 ExxonMobil has been implementing for many years at  
13 this site.

14 Q. Does the remediation at the site -- I realize  
15 you said it produces concentrations further away over  
16 time. But does it actually address the contamination  
17 that has already left the site directly?

18 A. It does not address the contamination that has  
19 migrated away from the site some distance. Obviously,  
20 what it does, it cuts off the source. So now we have  
21 a finite concentration and massive contamination  
22 off-site.

23 Q. And if you don't clean up the source, what  
24 happens instead?

25 A. Instead you got continued loading of the

1 contaminant into the groundwater and continued  
2 migration of those higher concentrations off-site.  
3 That's the importance of doing on-site source  
4 remediation.

5 Q. Now, did you make recommendations in your report  
6 of 2013 that Exxon actually made a comparable change  
7 to what they have done in the past as a result of your  
8 recommendations?

9 A. Yes.

10 MR. LENDER: Objection, your Honor.  
11 Foundation, because it was his recommendations. We  
12 would like to get a foundation for that.

13 THE COURT: I'm not sure of your objection.

14 MR. LENDER: Just the foundation. Whatever  
15 ExxonMobil did was because of his expert report. I  
16 would like a little foundation that was assumed in the  
17 question.

18 THE COURT: I understand.

19 MR. MILLER: I can try and lay that  
20 foundation, your Honor.

21 BY MR. MILLER:

22 Q. When you prepared your report in 2013, did you  
23 make some recommendations concerning additional  
24 activities that should occur at the site?

25 A. Yes, I did. In particular, I recommended that

1 the high levels of contaminant that were detected  
2 immediately west of the site, they were off-site, but  
3 immediately to the west, those should be remediated  
4 also. And, in addition, I also recommended an that  
5 additional investigation more distant from the site be  
6 conducted. Those are just two of the recommendations  
7 I made.

8 Q. And did Exxon do something after you made those  
9 recommendations in the areas you've just described?

10 A. Yes. Between the production of my expert report  
11 in 2013 and my evaluation of data in 2017 for this  
12 site, ExxonMobil had expanded their remediation  
13 program to pump contaminated groundwater from the west  
14 of the station, and they pumped that water to their  
15 on-site treatment system. So they had expanded  
16 remediation to the area immediately west of the  
17 station.

18 Q. Let's take that a step at a time. You take  
19 contaminated groundwater. It has MTBE in it. You  
20 said you treat it. What do you physically do to  
21 remove the MTBE?

22 A. So the technology that's most used and used in  
23 this case is one passes that contamination or the  
24 contaminated water through vessels that contain  
25 granular activated carbons. So this is a media that

1 absorbs contamination. It's usually made from either  
2 ground up coconut shells or bituminous coal that's  
3 been ground up.

4 Q. So if we looked at a filter for a fish tank, it  
5 would be similar to those granules if it was  
6 bituminous?

7 A. Yes. Often people have filters in their own  
8 home that you can actually attach to the tap. They  
9 contain a granular activated carbon. So they absorb  
10 organic chemicals.

11 Q. So that filter can be used to literally remove  
12 MTBE to what level? We start out with contaminated  
13 groundwater. We have to go through the treatment.  
14 What do you have?

15 A. Essentially, the system is operated so it's  
16 non-detect below the PQL.

17 Q. Did ExxonMobil use a treatment process at the  
18 station to clean up contaminated groundwater?

19 A. Yes. They used that process.

20 Q. Did they also use it in the western area  
21 off-site that you described recommending they install  
22 treatment in?

23 A. Yes. They used the existing treatment system  
24 they had on site and they just ran plumbing to  
25 off-site wells just to the west, installed pumps in

1 those wells, and pumped that contaminated groundwater  
2 to their on-site system.

3 Q. Do you agree that action on their part of  
4 installing treatment in the western area was  
5 appropriate and necessary?

6 A. Yes. It was consistent with the recommendations  
7 I made in my 2013 report.

8 Q. Now, you mentioned that in addition to  
9 recommending treatment in the western area in 2013,  
10 you recommended some off-site investigation. What was  
11 your goal in recommending that off-site investigation?

12 A. So in 2013 we had quite limited off-site data  
13 related to the release at the ExxonMobil station, that  
14 is, more distant beyond, say, Livingston Avenue, and,  
15 therefore, I had recommended the investigation of some  
16 depth discreet monitoring wells; that is, you complete  
17 the bore holes and install monitoring wells that are  
18 screened within specific layers.

19 Q. Why would you want them in specific layers?

20 A. Because one wants to know specifically where is  
21 the contamination in the subsurface, in which  
22 particular layers, and also one could then calculate  
23 where is it moving in those individual layers.

24 Q. Did Exxon do anything after 2013 in your report  
25 to conduct investigation in that area that you

1 described?

2 A. Yes. They did advance some very deep bore holes  
3 and completed sampling points at specific depths,  
4 within specific layers at those locations.

5 Q. And is that part of what you recommended?

6 A. Yes. That was somewhat consistent with what I  
7 recommended in 2013. I actually recommended more  
8 locations, but they had advanced some of those  
9 locations by 2017.

10 Q. And did that investigation have something to do  
11 with the distance from the service station to City  
12 Well 11, Livingston Well 11?

13 A. Well, the investigation was in that general  
14 direction and was more off-site towards the water  
15 supply well.

16 Q. And prior to the time that you recommended it,  
17 had Exxon placed any monitoring wells in the distance  
18 between the station once we get away from a station  
19 itself and City Well 11?

20 A. Well, historically, they had installed  
21 monitoring wells just to the west, as far as  
22 Livingston Avenue.

23 Q. A distance of how far about?

24 A. Maybe 350, 400 feet.

25 Q. So we have another almost a thousand feet to go

1 before we get to City Well 11?

2 A. Correct.

3 Q. And did you recommend that monitoring wells be  
4 put over that distance?

5 A. That is where I focused the additional  
6 investigation that I recommended for this site.

7 Q. And did the contamination of MTBE in City Well  
8 11 have something to do with that recommendation?

9 A. Yes. Obviously, we understood that well had  
10 been contaminated at some point in the past.  
11 Therefore, we felt it was highly likely that there was  
12 going to be some contamination within the bedrock to  
13 the west of Livingston Avenue.

14 Q. When those monitoring wells were drilled, did  
15 they determine that MTBE was in that additional  
16 distance between the furthest point of on-and-off-site  
17 monitoring associated with the Livingston station and  
18 the well, so when they drilled in the area you  
19 recommended, did they find MTBE?

20 A. They did find MTBE at certain locations and at  
21 specific depth intervals.

22 Q. And how were you able to predict what direction  
23 and what depth they should test and then find MTBE at  
24 that location?

25 A. Well, one evaluated first the groundwater flow

1 conditions, so which direction was groundwater flowing  
2 in, particularly, in the deeper bedrock, and where had  
3 historically MTBE been detected.

4 We knew there were several detections at Water  
5 Supply 11. We also knew there had been detections of  
6 MTBE right up to Livingston Avenue, just south and  
7 north of Mount Pleasant. So generally we knew from  
8 the distribution of the existing contamination and the  
9 groundwater flow direction that it was highly likely  
10 that contamination would be present west of Livingston  
11 Avenue.

12 Q. Is is your opinion that the Exxon Livingston  
13 station is the likely source of MTBE if it was  
14 detected in City Well 11?

15 A. Yes.

16 Q. And at the time you made your initial  
17 recommendations in 2013, had Exxon acknowledged that  
18 they were the source of contamination in City Well 11?

19 A. Not that I'm aware of.

20 Q. I want to turn to your key opinions. There are  
21 quite a list of them.

22 Did you develop this set of posed questions  
23 for each of the sites and answered them based on the  
24 data for individual sites?

25 A. Yes. I developed a set of 21 specific questions

1 that I would address for each individual site. So my  
2 answer to those questions would essentially be then  
3 from this list of opinions. So these questions were  
4 posed for every single site I evaluated, and the  
5 answers vary between sites based upon the  
6 site-specific information, and the answers were the  
7 opinions.

8 Q. For example, in question 6, you answered "no"  
9 because in your opinion no release from a different  
10 site commingled with the Exxon release?

11 A. I could not conclude that it was more likely  
12 than not that such a commingling of contamination had  
13 occurred. Therefore, my opinion is that, no, such  
14 commingling had not occurred.

15 Q. And in 2013, did you form the opinion the Exxon  
16 Livingston site was not only a threat, if we look at  
17 question 20, to the deep aquifer but also to potential  
18 receptors, namely, wells?

19 A. Yes, I did.

20 Q. In your opinion, did the additional  
21 investigation done after 2013 that you've described in  
22 this courtroom between the station and the well  
23 confirm that opinion?

24 A. Yes, it did.

25 Q. In other words, we now know that the release at

1 the Exxon station in your opinion is not just a threat  
2 to that well, it is the source of the MTBE in that  
3 well. Is that correct?

4 A. The source of the contamination that had been  
5 previously detected in that well.

6 Q. Now, in essence, samples were taken along the  
7 line between the station and the well, and MTBE was  
8 found when they drilled a well at an appropriate depth  
9 along that distance. Is that correct?

10 A. That is correct.

11 Q. How does that support or reject your opinion  
12 that it is the source?

13 A. We now know, based upon the additional  
14 investigation that ExxonMobil has been performing,  
15 that MTBE contamination is present in discrete bedrock  
16 zones to the west of Livingston Avenue, and that  
17 contamination is contiguous with the contamination on  
18 the east side of Livingston Avenue; that is, there is  
19 now contamination present between the ExxonMobil  
20 station almost all the way to the Public Water Supply  
21 Well 11.

22 Q. Okay. Let's turn to the feasibility study that  
23 you did for this site.

24 We previously talked about each of the  
25 technologies. You've abbreviated them under the

1 heading "Approach" in this table?

2 A. Correct, yes. We have not included the "No  
3 Action." We just included the seven other approaches.

4 Q. Some of the technologies are listed as low, some  
5 are medium, and some are high. What does "high"  
6 referred to?

7 A. So you may recall, as part of the feasibility  
8 evaluation, we evaluated the eight technologies under  
9 three criteria.

10 "Effectiveness" -- that is, would they be  
11 effective at addressing the contamination and lowering  
12 the risks to the environment and public health?

13 The second being their "implementability."  
14 Can you implement them? That is both technical  
15 implementation, can you physically do it, and  
16 administrative implementation? Would you be allowed  
17 to do it?

18 The third element would be a relative term of  
19 "costs." Are the costs low, medium, or high? Both in  
20 terms of capital, what you have to spend to put the  
21 system in in the first place, and then long-term  
22 operating cost.

23 THE COURT: So the OMM is your operating?

24 THE WITNESS: Operation and maintenance.

25 Q. And the capital cost is the cost of installing

1 the treatment system or technology. Correct?

2 A. It's installing the pumping wells, the plumbing,  
3 the infrastructure for the treatment plant, the  
4 treatment plant itself, the design and permitting of  
5 all of that. So it's all of those up-front costs that  
6 occur in a short period of time.

7 Q. So all of the technologies had a medium  
8 operating maintenance cost, except for pump and  
9 treatment which is rated as high, so it would be more  
10 expensive?

11 A. No. Actually, the way the evaluation is  
12 conducted, if the technology has low effectiveness and  
13 low implementability, then we don't consider the cost  
14 because, clearly, it's not going to be effective and  
15 it's not going to be implemented; therefore, the cost  
16 is irrelevant. So the little dash there means we  
17 don't have to evaluate the cost. So we only evaporate  
18 costs for technologies that are rated medium or high  
19 in terms of their effectiveness and implementability.

20 Q. Now, had Exxon already implemented some of the  
21 technologies listed, for example, soil vapor  
22 extraction at the site?

23 A. Yes. For the vadose zone, they had implemented  
24 a remediation system onsite that utilized soil vapor  
25 extraction.

1 Q. Did it work?

2 A. Yes. It has worked quite well.

3 Q. To explain, why did you list it as low in  
4 effectiveness?

5 A. Because here we are looking at its effectiveness  
6 to address the groundwater contamination, and SVE is  
7 not really applicable to groundwater. SVE which is  
8 the acronym for soil vapor extraction is not really  
9 applicable for groundwater. It's used to treat  
10 contamination above the groundwater.

11 Q. So the technologies that you believe, based on  
12 your site-specific information are likely to be  
13 effective, are listed as monitored natural attenuation  
14 off-site as opposed to on-site. Correct?

15 A. Correct.

16 Q. And pump and treat?

17 A. That is correct. And the pump and treat would  
18 be both for on-site contamination and the near-site.  
19 That is the area just to the west where high  
20 concentrations have been detected.

21 Q. Did Exxon also use the pump and treat technology  
22 with respect to the site?

23 A. Yes, they did. They implemented initially an  
24 on-site pump and treat program; and after 2013, they  
25 expanded it to include pump and treat just to the west

1 of the site.

2 Q. So does it appear in terms of Exxon's actions  
3 they formed a similar opinion on the technology which  
4 should be used and where it should be used?

5 A. Yes. The actions that Exxon has taken at this  
6 site are consistent with my recommendations.

7 THE COURT: Let me understand. You said they  
8 did pump and treat on or near the site just west of  
9 the site, and your recommendation is just west of the  
10 site. So are you suggesting there is anything else  
11 that needs to be done with regard to pump and treat or  
12 has that been completed?

13 THE WITNESS: With respect to this particular  
14 site, the current pump and treat system is the only  
15 active remediation or active restoration program that  
16 is required at this site. The remaining parts of the  
17 contamination could be addressed through monitored  
18 natural attenuation.

19 THE COURT: So your opinion is pump and treat  
20 is no longer an issue for restoration?

21 THE WITNESS: That is correct because  
22 ExxonMobil is already doing that.

23 THE COURT: So the only issue for this site  
24 is, as you see it, the monitoring wells?

25 THE WITNESS: There are actually two issues.

1           One is the ongoing monitoring of the wells to  
2 demonstrate that natural attenuation is controlling  
3 the contamination and reducing the concentrations into  
4 the future.

5           The second thing is there is still required  
6 some off-site investigation required.

7           THE COURT: I wanted to know what we are  
8 limiting ourselves to as to what still needs to be  
9 done in your opinion.

10           Maybe this is a good time to break. Let's be  
11 back at around 1:10, please.

12           THE DEPUTY CLERK: All right.

13           (The luncheon recess is taken.)

14           (Continued on the next page.)

15       ///

16

17

18

19

20

21

22

23

24

25

1                   A F T E R N O O N       S E S S I O N

2

3                   (In open court.)

4                   THE DEPUTY CLERK: All rise.

5                   THE COURT: Thank you.

6                   You may continue.

7

8                   **ANTHONY BROWN**, resumed.

9

10                  DIRECT-EXAMINATION (continued)

11                  BY MR. MILLER:

12                  Q.       Good afternoon.

13                  A.       Good afternoon.

14                  Q.       Mr. Brown, is the process of cleaning up  
15                          contaminated groundwater on-site and to the west,  
16                          those two extraction wells pumping to the centralized  
17                          treatment system, is that completed or is it ongoing?

18                  A.       As of the time of the preparation of my updated  
19                          expert report in 2017, it was still ongoing.

20                  Q.       And did you in your 2017 report take into  
21                          account that Exxon had done some of the work that you  
22                          had proposed so as to eliminate those items from your  
23                          estimate?

24                  A.       Yes. When you consider what I had recommended  
25                          in 2013, ExxonMobil had actually done some of that

1 work between 2013 and 2017. Therefore, I updated my  
2 recommendations in 2017 just to reflect what I felt  
3 was outstanding.

4 Q. Okay. I want to go to where we are today. So I  
5 want you to skip forward to site restoration.

6 This is a summary of your recommendations in  
7 your report. Is that correct?

8 A. On the 2017 report, yes.

9 Q. You recommend six monitoring well clusters. You  
10 previously described a cluster well is where you have  
11 multiple completions basically in the same hole?

12 A. Actually, no. A cluster well are monitoring  
13 wells completed in different holes very close to each  
14 other, within a few feet of each other.

15 Q. Hence, the name "cluster"?

16 A. Correct.

17 Q. And the reason you have several of them is so  
18 that you can do depth discrete sampling?

19 A. That is correct. You may recall, we have  
20 consolidated zones, and within the bedrock, we have  
21 Zones Z, A, B, C, D, and then clearly even zones below  
22 that. So we had recommended that the wells be  
23 screened in those individual zones.

24 Q. And what did the six monitoring well clusters  
25 have to do with your site restoration plan?

1 A. Essentially, they would allow us first to have  
2 greater understanding of the distribution of the  
3 contamination within the aquifer to the west of the  
4 Exxon site, and then those wells can be used to  
5 perform the ongoing monitoring needed to demonstrate  
6 natural attenuation was sufficient to ultimately allow  
7 the restoration of groundwater to a pre-discharge  
8 condition.

9 Q. So the monitored part of natural attenuation,  
10 your proposal is six well clusters?

11 A. Actually, the monitoring would be done on all of  
12 the wells. This means we believe there were still six  
13 locations where additional data was needed.

14 THE COURT: And how many wells was that going  
15 to include?

16 THE WITNESS: To date, there are 40 monitoring  
17 wells at the site, and then we are proposing six  
18 clusters.

19 THE COURT: When you say "clusters," how many  
20 in a cluster?

21 THE WITNESS: It varies. In some there's only  
22 two, and in other there are five. I can't remember  
23 the exact number, but it's probably on the order of  
24 about 20 more monitoring points.

25 THE COURT: Is there any issue with the

1 location of them and who owns the property?

2 THE WITNESS: We don't believe so. We tried  
3 to position them either on property where wells have  
4 already been installed or on properties where we  
5 believe you should be able to get access.

6 BY MR. MILLER:

7 Q. The recommendation for six monitoring well  
8 clusters is specifically tailored to this site and  
9 MTBE concentration factors?

10 A. Correct. Those are specific to the conditions  
11 at this particular site.

12 Q. Is that particular set of recommendations  
13 contained in your 2017 report?

14 A. It is, yes.

15 Q. And was an earlier version with additional  
16 recommendations in your 2013 report?

17 A. There was in my 2013 report. There were  
18 additional recommendations within that report.

19 Q. And you've downsized them to fit the current  
20 situation?

21 A. Correct. ExxonMobil had performed certain  
22 actions subsequent to 2013 that required me to reduce  
23 the scope of the recommendations for this site in  
24 2017.

25 Q. Next slide, please.

1           This is your list of site restoration products  
2 of a part of 2017 expert report?

3       A.       That is correct, yes.

4       Q.       There is only one item that has an asterisk,  
5 "well-head treatment system design permitting," 59  
6 thousand and change, and the asterisk at the bottom  
7 says, "claim withdrawn."

8           MR. MILLER: Your Honor, to clarify, we've  
9 notified counsel in writing that we are not making  
10 that claim in view of the current situation. The rest  
11 of it describes the additional work that needs to be  
12 done for --

13          THE COURT: That should be crossed out and  
14 that amount deducted. Right?

15          MR. MILLER: Correct.

16          THE COURT: Thank you.

17          THE WITNESS: I should clarify. There is also  
18 a contingency that would be deducted as well. So the  
19 total that would be deducted is the 59,000 for that  
20 line item and another 10,000 of contingency.

21          THE COURT: But you have \$247,410 on  
22 contingency. You are only taking a small amount out  
23 of that?

24          THE WITNESS: 10,000, which would be the  
25 contingency related to the well-head treatment.

1 THE COURT: Tell me what "contingency" means.

2 THE WITNESS: So obviously when performing a  
3 investigation and restoration program, when one  
4 develops an initial cost, there is always some degree  
5 of uncertainty what the ultimate cost might be, and in  
6 fact I think it's probably pretty normal in our  
7 business to find that the ultimate cost is often more  
8 than one initially estimates.

9 Sort of when you get a contractor to do some  
10 work on your house, the chances of him coming under  
11 that bid are pretty slim. So, generally, we find that  
12 the costs are greater because of uncertainties. So  
13 the contingency addresses those uncertainties.

14 THE COURT: How did you determine what the  
15 contingency is? A certain percentage?

16 THE WITNESS: Correct. For this site it's 15  
17 percent, and it's based upon contingency factors that  
18 are documented by USEPA for when one is preparing such  
19 costs.

20 THE COURT: Okay

21 BY MR. MILLER:

22 Q. Did you also use the standard methodology for  
23 coming up with the costs?

24 A. Yes, we did.

25 Q. Could you briefly describe it.

1       A.       Certainly.   So what we did is we developed  
2       essentially a very large menu of likely items that  
3       would have to be done at any particular service  
4       station, and I believe they were on the order of 70  
5       different items on the menu from installation of the  
6       monitoring well in bedrock to 50 feet might be one  
7       line item.   It could be the installation of a granular  
8       activated carbon treatment system.

9               So there were various line items that when one  
10       looks specifically at the site you would pick from the  
11       menu, and the line item costs were based on either  
12       fixed hard numbered bids that we received from local  
13       contractors, estimated costs from publications.   There  
14       are a series of publication put out that document  
15       typical construction costs.   And then also for  
16       professional services, our own estimate, as to what  
17       those would be.

18              THE COURT:   Could you just explain -- because,  
19       obviously, if I added every one of these line items,  
20       it's more than your bottom line.   So what am I  
21       actually adding?

22              THE WITNESS:   So you are actually adding the  
23       total capital cost --

24              THE COURT:   Take out the cost of the  
25       monitoring wells on top.

1 THE WITNESS: So the monitoring wells and the  
2 wellhead capital --

3 THE COURT: That was all part of the total  
4 capital.

5 THE WITNESS: -- would have come into total  
6 capital.

7 THE COURT: Got it.

8 THE WITNESS: Because the wellheads come out,  
9 the total capital amount would be the 860,000. Then  
10 you are adding that to the NPV monitoring, the  
11 730,000. That's based on the annual monitoring  
12 cost and --

13 THE COURT: It's the 159,449 is per year and  
14 you multiply that by five.

15 THE WITNESS: Five, and you adjust it for net  
16 present value.

17 THE COURT: Okay. I've got it.

18 THE WITNESS: And that comes to 730,000. And  
19 then you have a contingency on top of those two  
20 numbers, which is 15 percent of the total. So you are  
21 adding it up. In this case now one item has been  
22 removed -- 860, 730, and 247.

23 THE COURT: I have it. Thank you.

24 BY MR. MILLER:

25 Q. Why did you recommend monitored natural

1     attenuation for five years versus some other period of  
2     time, please?

3     A.     Well, we actually performed an analysis of how  
4     long the contamination would persist from 70 parts per  
5     billion to 1 part per billion based upon certain  
6     degradation factors; and based on the various  
7     scenarios we run, it was somewhere from five to  
8     70 years. Therefore, we took the most conservative,  
9     that is, the lowest number of years in developing our  
10    costs, even though it could run much longer than that.

11    Q.     Okay. There is some discussion in the papers  
12    about FLUTE wells versus cluster wells. What is a  
13    FLUTE well?

14    A.     So a FLUTE well is a fairly innovative new  
15    approach to completing multi-level monitoring points.

16            So you may recall, what we are recommending is  
17    multiple wells close to each other in a cluster.

18    There are a variety of approaches that can be used to  
19    draw a single hole, and complete a much more  
20    complicated completion that has multiple sample ports.

21            So essentially you only have one hole, it's a  
22    bigger hole, but then you have a much more complicated  
23    completion. FLUTE well is one of those types of  
24    approaches. The other one we often see commonly is  
25    called a Westbay system.

1 Q. What is the concern, if any, with either the  
2 Westbay or FLUTe systems, if you could briefly explain  
3 that?

4 A. Generally, the concern when one is completing a  
5 single bore hole with multiple sample ports is that  
6 you can get a cross contamination between the ports  
7 because essentially your seal between the ports is  
8 quite small. Therefore, that seal can become pump  
9 compromised. So there is greater concern about how  
10 valid the results would be from a multi port versus a  
11 cluster well where you know the well is completed just  
12 in just one zone.

13 THE COURT: Are FLUTe wells accepted?

14 THE WITNESS: Yes, they are. Westbays are  
15 too. They have been around longer. With the history  
16 I know of, there have been a lot of problems with  
17 Westbays, and I had clients that drilled them out and  
18 had to replace them.

19 THE COURT: I'm not sure I got a  
20 differentiation between Westbays and FLUTe wells.

21 THE WITNESS: They are actually just two  
22 different methodologies to complete a multiple sample  
23 ports in a single bore hole.

24 BY MR. MILLER:

25 Q. If, for purposes of understanding this FLUTe

1 well concept, you have shallow contamination at a  
2 particular layer, and you have a desire or need to  
3 sample lower than that, what would happen if the  
4 single bore hole was used and the system failed for  
5 any reason, to maintain separation for each of the  
6 layers where they are taking samples?

7 A. Obviously, the concern then is you get cross  
8 contamination between the layers. So your sample is  
9 no longer as valid because it doesn't represent a  
10 single zone.

11 Now, the way the wells are intended to be  
12 installed, the hope is that that doesn't occur.  
13 Unfortunately, with the history I know of the Westbay  
14 system, it had occurred quite a bit of time in these  
15 multiple completions.

16 Q. Could you literally introduce how it  
17 contaminated groundwater that is shallow into a deeper  
18 zone?

19 A. You could. That would mean you would be  
20 installing one of these wells in an area where there  
21 is very high shallow contamination, which generally  
22 that's not where they are installed. They are usually  
23 installed more distant from the release.

24 So you would usually be in monitoring levels  
25 that are in tens or hundreds of parts per billion, not

1 the tens of thousands.

2 THE COURT: So that's not a real concern.

3 THE WITNESS: Particularly for this site, that  
4 would not be a concern.

5 These wells, the FLUTE wells that have been  
6 installed, are out in the more distant location where  
7 one would not expect to see very high levels in  
8 shallow zones.

9 Q. Are FLUTE wells relatively new?

10 A. The gentleman that developed them developed them  
11 some time ago. But I would say they have only been  
12 used more widely in recent years. In fact, this is  
13 the first case I'm aware of where FLUTE wells were  
14 used. I'm sure they've been used elsewhere, but it's  
15 the first one that I have come across.

16 Q. Did the FLUTE wells have a track record that  
17 tells us how reliable they are?

18 A. I couldn't say. I have not evaluated the  
19 technology in its wide-spread use.

20 Q. Okay. Why did you recommend cluster wells  
21 instead of FLUTE wells?

22 A. Cluster wells provide a more rigorous sampling  
23 process. Because you are drilling an individual bore  
24 hole for each sample interval, you know you have  
25 eliminated the risk of cross contamination if you

1 complete the well perfectly, which would be a normal  
2 well completion process.

3 In addition, many of the existing locations  
4 that have been drilled by ExxonMobil were already  
5 cluster wells. They had already been using that  
6 approach to investigate the contamination at the site  
7 up until the more recent period when they had used  
8 some FLUTE wells.

9 THE COURT: What is the difference in cost  
10 between a FLUTE well and a cluster well?

11 THE WITNESS: I don't know the exact number.  
12 I would anticipate because it's a single bore hole or  
13 be it a larger bore hole, the FLUTE wells would be  
14 less expensive.

15 THE COURT: You don't know if it's  
16 demonstrably less or what the cost actually is?

17 THE WITNESS: I don't. We reviewed the expert  
18 reports for ExxonMobil's experts and we couldn't  
19 identify any cost they presented as to the cost of the  
20 FLUTE wells.

21 THE COURT: So essentially your opinion today  
22 is based on what you think is the best course to take,  
23 and it's not looking at a cost comparison because you  
24 don't really know what the cost differential would be?

25 THE WITNESS: I think that's a reasonable

1 summation, yes.

2 THE COURT: Is FLUTE a brand name?

3 THE WITNESS: I think it may even be  
4 trademarked.

5 THE COURT: Thank you.

6 BY MR. MILLER:

7 Q. Now, the defendants in their papers claim that  
8 your recommendation for five years of monitored  
9 natural attenuation was arbitrary and duplicative. Do  
10 you have a response?

11 MR. TULLY: Your Honor, I'm just curious, no  
12 part of this defendant's motion is seeking to exclude  
13 this expert on his cost calculations. I'm just not  
14 sure this is a productive use of our time.

15 MR. MILLER: I'll stop, with the Court's  
16 permission.

17 THE COURT: Okay. Go ahead.

18 BY MR. MILLER:

19 Q. I want to move to the Bakers Gulf service  
20 station site.

21 MR. MILLER: Which is Plaintiff's Exhibit 5 in  
22 the PowerPoint, your Honor.

23 Q. This is a station located on the Franklin  
24 Turnpike in Waldwick, New Jersey, and you reviewed the  
25 history of the site and you summarized it here. Is

1     that correct?

2     A.     Correct, yes.

3             In this slide we show on the left just the  
4     vicinity of the site, and the yellow star in the  
5     middle is the location of the service station. The  
6     insert map is the State of New Jersey, and we can see  
7     this site is in the northeast corner of the state, and  
8     then we summarize its location and the history as an  
9     operating gasoline station.

10            MR. TULLY: Your Honor, before we go further,  
11     if we can get some clarification, a number of slides  
12     referred to, and, therefore, I'm expecting the  
13     testimony the witness will be attempting to give  
14     relate to information that was not considered as part  
15     of the August 2017 supplemental report, and that's the  
16     basis of our motion.

17            I just wanted to get some guidance because it  
18     would be inappropriate to now supplement essentially  
19     his expert report by testifying as to data that he did  
20     not review.

21            THE COURT: That he did not review. You mean  
22     didn't review at the time of his 2017 report.

23            MR. TULLY: Some of which was not even sought  
24     after the 2017 report, and plaintiffs concede in their  
25     briefing that information that was provided as to many

1 of these well locations, it was provided in 2013, and  
2 it is not referenced in any fashion in the 2017  
3 report.

4 And now in these slides, if you look at the  
5 back of the deck, apparently the testimony will be as  
6 to that data, starting at slide 17 -- your Honor, this  
7 is what we pointed out in our reply.

8 The witness also submitted an affidavit in  
9 support of the opposition to the Daubert motion that  
10 made some of these same points. And as we argued in  
11 our reply, I think quite correctly, you just can't do  
12 that. He's now essentially supplementing his 2017  
13 report with information that he apparently didn't even  
14 have when he finalized that report.

15 That's the essence of our motion, your Honor.  
16 So this examination and cross-examination will take a  
17 very different tact if he's either allowed to  
18 supplement his report, which I contend he should not  
19 be, or if he is.

20 THE COURT: Mr. Miller.

21 MR. MILLER: Your Honor, I use a PowerPoint as  
22 a guide, and you will see that I adjust my questions  
23 to the situation and don't necessarily go over every  
24 point in the PowerPoint just as I had not yet. When  
25 we get to that area, I can explain what we are doing

1 and why we are doing it the way we are. I thought it  
2 was important to put it in context --

3 THE COURT: The underlying question being  
4 raised is, Are there now attempts to give opinions  
5 about matters for which there was evidence prior to  
6 the submission of his report, which he did not include  
7 in his original report but is now opining on.

8 MR. MILLER: His opinions have not changed one  
9 iota at all. In fact, this data that they are talking  
10 about is in my judgment trivial compared to the total  
11 amount of data that was used and the total number of  
12 documents that were used. I think we need to put it  
13 in that context, and it will assist the Court in  
14 deciding whether or not their point has any real  
15 relationship to his opinions.

16 THE COURT: I'm going to allow some testimony  
17 on it. We'll put it in context when he  
18 cross-examines --

19 MR. TULLY: I was going to suggest, if we take  
20 it conditionally --

21 THE COURT: That's fine. I think that's the  
22 way to go.

23 MR. MILLER: I have no objection to taking it  
24 conditionally.

25 THE COURT: All right. Please continue.

1 BY MR. MILLER:

2 Q. Can we go to the next slide which discusses the  
3 site location.

4 There are about 40 monitoring wells associated  
5 with this site. Correct?

6 A. There are 40 monitoring wells that either have  
7 been installed by the parties responsible for the  
8 release at the Gulf station or installed by other  
9 parties but monitor the contamination associated with  
10 the release at the Gulf station.

11 Q. We'll get to the other parties in a little bit.

12 Basically, those 40 monitoring wells  
13 associated with the station, you have chemical  
14 monitoring data for MTBE and TBA for how many years?

15 A. For 19 years.

16 Q. Do you regard that as a sufficient data set in  
17 which to base opinions?

18 A. Yes. For this site there is a reasonable  
19 chemistry data set, yes.

20 Q. Did you consider all 19 years of data in doing  
21 your analysis?

22 A. I did, yes.

23 Q. Up through 2017, the time of your last report.  
24 Correct?

25 A. Correct.

1 Q. All right. And then in terms of the amount of  
2 documentation you used for this site, it's over 8,000  
3 documents. Correct?

4 A. That is correct.

5 Q. Let's go to the next slide.

6 It discusses the regional hydrogeology. Can  
7 you explain the setting to us, please, from a  
8 hydrogeological perspective .

9 A. Certainly, yes. And I will try to keep it as  
10 simple and understandable for a layman as possible.

11 Essentially, the site is located in an area  
12 where the initial deposits below the ground surface  
13 are again unconsolidated sediments. They are actual  
14 glacial deposits. They contain both coarse grain  
15 units like sand and gravel, and also some finer units  
16 that contain some glacial silts and clay.

17 Below that there is bedrock again, and, again,  
18 in this area the bedrock is essentially dipping, and  
19 here it's dipping to the south, and the bedrock is  
20 part of what's referred to as the Passaic Formation.  
21 It contains one of the main aquifers that's used for  
22 water supply in this part of New Jersey

23 Q. The next slide, please.

24 You evaluated receptors. Correct?

25 A. Yes. As part of our assessment of the regional

1 background information we identified eight public  
2 water supply wells within one mile. Now, only two of  
3 those are within what was termed the court delineation  
4 area and the others were outside of that area.

5 We also identified the nearest surface water  
6 bodies, including the pond and the brook about  
7 1500 feet to the south of the service station.

8 Q. Now, there were MTBE detections in some of those  
9 receptors. Is that correct?

10 A. That's correct.

11 The next slide actually shows some of the  
12 detections at the Ridgewood Andover Well, and there  
13 was one just one detection back in 1999, and there  
14 were also some detections at the additional well we  
15 identified. Again, these were historical detections,  
16 and there have not been consistent detections  
17 particularly in recent years.

18 Q. Why a "non-detect" followed by a "detect," if  
19 you can briefly explain?

20 A. There are two issues one has to consider here.

21 The first is, say, for example, at the  
22 Ridgewood Andover Well in 1999, the concentration that  
23 was detected in July of that year was .7 parts per  
24 billion. It was very low. In fact, it was even below  
25 the PQL. So non-detect might be very close to that

1 concentration, but the lab just couldn't see it.

2 Q. Even if you have consistent detection in the  
3 well, when you look at the chemistry data, is it  
4 common to have variation in the concentration?

5 A. Yes. In fact, one would expect that. The  
6 sample is never identical each time you take a sample.  
7 The old adage is: You never step in the same river  
8 twice.

9 Q. And the chronology for the site, please. You  
10 reviewed the historical data and plotted it on a  
11 timeline. Is that correct?

12 A. Yes. You may recall in the standard methodology  
13 that we used, Step 3 was to review the site-specific  
14 data, and that included developing a very complete and  
15 lengthy summary of all of the activities at the site,  
16 and then we summarized the key elements on this  
17 timeline.

18 Q. The maximum concentration of the MTBE at the  
19 site was what and when?

20 A. The maximum concentration was 2,500,000 parts  
21 per billion. That was detected, I believe, in 1999.

22 Q. In a monitoring well on the site property?

23 A. It was MW-5.

24 Q. Which is an abbreviation for monitoring well  
25 No. 5 associated with this station?

1 A. That's correct.

2 Q. You also made a note in 2012 on this chronology  
3 that the latest maximum MTBE concentration at Kaplan  
4 Cleaners was 14,000 parts per billion, listing a  
5 monitoring well number. Correct?

6 A. That is correct.

7 Q. And that's in 2012 at Kaplan Cleaners Monitoring  
8 Well 2-D. And in your 2013 report did you discuss  
9 MTBE's occurrence in Kaplan Cleaners wells?

10 A. I did, yes.

11 Q. Now, a dry cleaners such as Kaplan Cleaners,  
12 MTBE is not something you would expect to be at their  
13 site from their activities. Is that correct?

14 MR. TULLY: Objection; foundation.

15 THE COURT: It's basically a leading question.  
16 So why don't you just ask him the question.

17 MR. TULLY: It also calls for speculation.

18 THE COURT: I don't know that it does. The  
19 real question is: Do you get MTBEs from dry cleaners  
20 from what they do?

21 MR. TULLY: You do if they have underground  
22 storage tanks on premises.

23 THE COURT: Look, you're testifying for me  
24 now. That's your cross-examination. We're talking  
25 about from the general use of the dry cleaners. Feel

1 free to explore this on your questioning. We will  
2 eventually get to that.

3 BY MR. MILLER:

4 Q. Kaplan Cleaners had monitoring wells of their  
5 own for their site. Correct?

6 A. That is correct, yes.

7 Q. What was their contaminant of concern or the  
8 reason they were doing this monitoring?

9 A. They were investigating a release of PCE, which  
10 is perchloroethylene, and it often goes just by the  
11 abbreviation PCE, and that is the solvent used in dry  
12 cleaning.

13 Q. Okay. So is PCE commonly associated with dry  
14 cleaning sites that have had releases?

15 A. Yes. It was historically used as the dry  
16 cleaning solvent in nearly all dry cleaning sites.

17 Q. And when they submitted samples that tested for  
18 PCE, is it uncommon to have MTBE results disclosed by  
19 the lab?

20 A. No. Now that the labs include the ether  
21 oxygenates as part of the standard analytical package  
22 for volatile constituents, the lab reports not only  
23 the PCE but the concentration of the ether oxygenates,  
24 including MTBE, along with many other constituents.

25 Q. So when you reviewed a completely separate file

1 for Kaplan Cleaners, did you find some MTBE data that  
2 you used in your 2013 opinion?

3 A. Yes. As part of the analysis of samples taken  
4 at the Kaplan Cleaners during their investigation,  
5 they had detected high concentrations of MTBE in the  
6 deeper samples that is within the lower intermediate  
7 zone in the bedrock.

8 Q. How did that relate to your 2013 opinions,  
9 briefly?

10 A. Essentially, we had identified that this site  
11 was directly down-gradient of the release at the Gulf  
12 station, and this site had detected high  
13 concentrations of MTBE in the groundwater,  
14 particularly deeper groundwater, that clearly were  
15 associated with the release at the Gulf station.

16 Q. Now, if you have a release at the Gulf station  
17 in millions of parts per billion, can that create a  
18 plume that is long and large?

19 A. It can, yes, long and large; and in this  
20 particular case, also, it dives and goes deep as it  
21 migrates to the south.

22 Q. And the concentration at the dry cleaners of  
23 more than 10,000 parts per billion, actually 14, in  
24 your mind and in your opinion, is that reasonably  
25 explained by migration of an MTBE plume from the gas

1 station we are talking about, Bakers Waldwick Gulf, to  
2 the Kaplan Cleaners site?

3 A. Yes, that is what's indicated. It is associated  
4 with the release at the Gulf site.

5 Q. Since you were seeing it in 2013 in the tens of  
6 thousand of parts per billion, did you expect that if  
7 we went back there in 2017 it would all be gone?

8 A. No.

9 Q. Why is that?

10 A. Essentially, the concentrations obviously were  
11 very high for an off-site location. There was no  
12 active remediation going on for the groundwater in  
13 that area; therefore, one would have expected the  
14 concentrations to persist not only because they were  
15 there previously, but because they would be continuing  
16 to migrate in that direction from the Gulf site.

17 Q. And in forming that opinion, did you consider  
18 the nature of remediation activities at the Gulf  
19 station?

20 A. Yes. There had been ongoing remediation at the  
21 property itself, the Gulf property.

22 Q. Could you describe that, briefly.

23 A. Yes. They had been conducting some multiphase  
24 extraction and air sparging. You may recall, I  
25 discussed those technologies earlier. Essentially,

1 they were bubbling air into the aquifer to oxygenate  
2 and strip out some of the contamination, and then they  
3 were doing multiphase extraction to suck out high  
4 levels of contamination in the vadose zone and  
5 dissolved in the groundwater directly beneath the  
6 site.

7 Q. And throughout the history of this site, up to  
8 your 2017 report, did they have any pump and treat  
9 system that was designed to prevent MTBE dissolved in  
10 groundwater from moving away from the site?

11 A. They did not.

12 Q. And in contrast, the Exxon Livingston station  
13 did have that. Correct?

14 A. The Exxon station did have an on-site pump and  
15 treat system which they later expanded to even include  
16 pumping off-site.

17 Q. So, basically, given the nature of the  
18 remediation being done at this Gulf station, did you  
19 expect that distant contamination such as that at  
20 Kaplan Cleaners would continue to occur?

21 A. Yes, that's a fair statement.

22 Q. And was that concept expressed in your written  
23 reports in both 2013 and 2017?

24 A. Yes, it was.

25 Q. And when you were preparing your 2017 report,

1 were you able to get your hands on updated Kaplan  
2 Cleaners data?

3 A. Between the preparation of the 2013 report and  
4 the 2017 report, we had expected that additional  
5 samples had been taken at the Kaplan Cleaners site;  
6 therefore, we made a request through legal counsel if  
7 that information could be obtained. But as of the  
8 time of the preparation of my report in 2017, we have  
9 not received that data.

10 Q. Now, if we look at the groundwater contamination  
11 data, if we can turn to that slide, please -- I'm  
12 sorry, groundwater flow. I inadvertently skipped one.

13 This is concepts that you had about how  
14 groundwater was moving with MTBE in it that were  
15 expressed in your opinions. Is that correct? Your  
16 reports.

17 A. Yes. Here we're summarizing the groundwater  
18 conditions at and to the south of the Gulf site.

19 Q. And did the flow directions that you describe  
20 here include movement of a plume of MTBE toward the  
21 Kaplan Cleaners site?

22 A. Yes. In general, it's moving to the south.

23 Q. And you have expressed the opinion that both in  
24 bedrock and in the unconsolidated material it's moving  
25 at times to the south and then other times to the

1 southwest; this is the natural variation in flow  
2 direction. Is that correct?

3 A. In the shallow zone. In the intermediate zone,  
4 it varies south-southwest to south-southeast; and in  
5 the bedrock, generally, it's south-southeast.

6 Perhaps if we go to the previous slide, it  
7 annotates here that cross-section that shows those  
8 different zones.

9 Q. And is that opinion about the direction of the  
10 groundwater flow based on hydrogeological data,  
11 namely, measurements of water levels in wells?

12 A. That is correct.

13 Q. Let's turn to the groundwater contamination  
14 summary.

15 The first detection at the site was 81,000  
16 parts per billion, but the concentration went up  
17 two years later to 2,500,000 parts per billion. Why  
18 would it go up during that period of time?

19 A. Well, actually, those were samples taken at two  
20 different wells. When it was first detected at the  
21 site, they had drilled four wells. So the first  
22 detection was in MW-1, Monitoring Well 1.

23 Subsequently, they installed some additional  
24 monitoring wells. And when they sampled MW-5 a couple  
25 of years later, that was the well that was closest to

1 the point of the release, and had the maximum  
2 concentrations.

3 Q. Is that the apparent explanation for the change?

4 A. Yes. It's simply the location of the well.

5 Q. I want to go to the remediation plan.

6 Before I get there, with respect to the  
7 feasibility study for Bakers Gulf, did you follow the  
8 same procedures you described earlier?

9 A. Yes. It was the exact same analysis. We did a  
10 feasibility analysis or feasibility study that applied  
11 for all of the sites, and then we specifically  
12 selected the technologies that were appropriate for  
13 each individual site, and the feasibility study was  
14 contained within my expert report along with the  
15 site-specific selection of technologies.

16 Q. The next slide, please.

17 This is your site restoration plan. It  
18 involves a recommendation for 11 monitoring well  
19 clusters and one off-site pump and treat system and  
20 monitored natural attenuation for five years after  
21 pump and treat. Is that correct?

22 A. That is correct, yes.

23 Q. One of the reasons you are recommending a pump  
24 and treat system is to date none has ever been done at  
25 this site. Is that correct?

1 A. There had been no pump and treat and there had  
2 been no off-site remediation to address the high  
3 levels of contaminant present to the south of the Gulf  
4 site.

5 Q. And that's the reason you recommended the pump  
6 and treat system?

7 A. Yes, along with other factors. We obviously  
8 considered the hydrogeologic conditions that would  
9 make pump and treat the most appropriate technology.

10 Q. Now, does the Bakers Waldwick Gulf site have as  
11 extensive an off-site monitoring network as the Exxon  
12 station?

13 A. I would not say it's as extensive. They do have  
14 a significant number of wells, especially when you  
15 consider the wells that were installed as part of the  
16 Kaplan Cleaners investigation. However, there's still  
17 significant data gaps in terms of identifying where  
18 the contamination is present to the south of the site.

19 Q. And is that the reason you recommended the  
20 higher level or number of monitoring well clusters?

21 A. That's correct.

22 Q. You recommended monitored natural attenuation  
23 for five years after pump and treat. Why not during  
24 pump and treat?

25 A. Actually, the monitoring does go on while the

1 pump and treat is taking place. So the monitoring is  
2 done on a quarterly or in some cases semi-annual basis  
3 from the time the wells are first installed.

4 So what we are recommending here is that  
5 monitoring should continue for five years after the  
6 pump and treat system stops operation.

7 Q. Basically, after you get down to concentrations  
8 70 parts per billion or lower. Correct?

9 A. For MTBE, that's correct, yes.

10 Q. Then you have a site restoration cost estimate,  
11 the next one, and you used the same techniques for  
12 developing the restoration costs and recommendations  
13 for this site, as you described earlier. Is that  
14 correct?

15 A. Yes, the same approach we took to all of the  
16 sites.

17 Q. Now, let's go to the Kaplan data.

18 MR. TULLY: Your Honor, just so that you can  
19 follow along, this is now the data that was in the  
20 plaintiffs' possession but not considered at the time  
21 of the 2017 report.

22 THE COURT: Thank you.

23 BY MR. MILLER:

24 Q. The Kaplan data involves eight monitoring wells.  
25 Is that correct?

1 A. There are eight monitoring wells at the site,  
2 that is correct.

3 Q. And when you did your 2013 report, you had data  
4 from that set of monitoring wells that included MTBE  
5 detections. Is that correct?

6 A. That is correct. We had data collected prior to  
7 the preparation of my expert report.

8 Q. Now, had anything changed between 2013 when you  
9 did your original report and 2017 when you did your  
10 supplemental report that would cause the natural  
11 behavior of MTBE in groundwater to change, in your  
12 opinion?

13 A. Not that I could think of, no, other than the  
14 continued migration.

15 Q. So given the nature of MTBE, you expected it to  
16 continue to go into groundwater in the service station  
17 area. Correct?

18 A. Actually, if you look at the on-site remediation  
19 that was done at the Gulf site, they had actually  
20 removed most of the contamination beneath the Gulf  
21 site. So the concentrations on the site had been  
22 declining significantly during the period they  
23 implemented the on-site remediation program.

24 Q. Okay.

25 A. So we were not looking really at a situation

1 where there was significant new contamination being  
2 added to the groundwater. So we had a finite  
3 concentration or massive contamination that now was  
4 simply migrating further to the south.

5 Q. And the groundwater was going to continue to  
6 move unimpeded away from the site and toward the  
7 Kaplan Cleaners, in your opinion?

8 A. And beyond the Kaplan Cleaners.

9 Q. And that was your opinion in 2013?

10 A. It was, yes.

11 Q. And 2017?

12 A. Correct.

13 Q. Now, if you compared all the data associated  
14 with the Kaplan Cleaners site to all the data you had  
15 for the overall MTBE picture for the Gulf station,  
16 could you describe the relative contribution of those  
17 data points for me?

18 A. If I understand the question correctly, if we  
19 just took the wells that are being installed by Gulf,  
20 which is approximately 32 wells, and they had  
21 monitoring data for 19 years collected multiple times  
22 a year for all of those locations, we had a very  
23 significant data set.

24 For Kaplan Cleaners they installed eight  
25 wells, and I believe at the 2013 timeframe, the wells

1 had only been sampled once or twice. So a much more  
2 limited data set for the Kaplan Cleaners than we had  
3 for the wells being installed by Gulf.

4 Q. So they weren't sampling the wells as  
5 frequently. Is that correct?

6 A. That's correct.

7 Q. Do you have any understanding why that was?

8 A. I can't say for certain, but I believe the  
9 Kaplan Cleaners was essentially an orphan site. That  
10 means there was no responsible party who was  
11 implementing the investigation remediation program and  
12 therefore was relying on public funds to implement the  
13 program.

14 Q. Have you looked at the Kaplan Cleaners data  
15 since 2013 as part of your response to this motion?

16 A. Yes. You may recall earlier I mentioned that we  
17 had assumed there may be some new samples that had  
18 been collected at the Kaplan Cleaners between 2012,  
19 which is when we had a data set to prepare the report,  
20 and 2017 when my updated report was prepared.

21 We made a request through legal counsel if  
22 there was any data, but at the time of the preparation  
23 of the 2017 report we had not received that data, but  
24 we did receive it subsequent to the preparation of the  
25 2017 report.

1 Q. And did they find MTBE at lower concentrations  
2 later in time?

3 A. At Kaplan Cleaners?

4 Q. Yes.

5 A. No. The concentrations were very similar. In  
6 fact, slightly higher.

7 Q. So the conditions were essentially unchanged in  
8 terms of the concentration. Correct?

9 A. Yes. The new samples essentially confirmed the  
10 earlier results.

11 Q. And did it provide any new information that you  
12 didn't have before?

13 A. It provided new data. But that data simply  
14 confirmed the previous data I had that supported the  
15 opinions that I presented.

16 Q. Did you form any new opinions because of getting  
17 the additional Kaplan's data after 2013?

18 A. No.

19 Q. Are your opinions the same today after reviewing  
20 it?

21 A. Yes.

22 Q. Would it change the estimate of the cost of  
23 dealing with it at all, the contamination?

24 A. It has not, no.

25 MR. MILLER: That's all the questions I have

1 at this time, your Honor. I was trying to finish at  
2 2:00, and I missed.

3 THE COURT: I think you're close enough.  
4 Livingston is going to go first.

5 MR. LENDER: Yes, your Honor. Would it be  
6 okay if I just take a five-minute break.

7 THE COURT: Okay.

8 THE DEPUTY CLERK: All rise.

9 (Recess.)

10 \* \* \* \* \*

11 (In open court.)

12 THE DEPUTY CLERK: All rise.

13 THE COURT: Thank you.

14 You may proceed.

15 CROSS-EXAMINATION

16 BY MR. LENDER:

17 Q. Mr. Brown, you filed your initial expert report  
18 concerning the Livingston site back in November of  
19 2012 and a revised report in January of 2013. Is that  
20 correct?

21 A. That is correct.

22 Q. And then you issued your most recent report in  
23 August of 2017. Right?

24 A. That is correct.

25 Q. During that more than four-year period between

1 your original report and your most recent report, the  
2 Livingston site has continued to be cleaned up under  
3 the direction of the LSRP. Correct?

4 A. That's my understanding.

5 Q. And just so we have it, that's a new term we  
6 used for the first time. An LSRP is a licensed site  
7 remediation professional who is licensed by the State  
8 under the supervision of the Department of  
9 Environmental Protection and is responsible for  
10 cleaning up sites in New Jersey. Correct?

11 MR. KAUFMANN: Your Honor, that's a legal  
12 issue and that's an incorrect description of what an  
13 "LSRP" is. An LSRP is licensed by the State and --

14 THE COURT: I prefer that you not testify. So  
15 if you think it's not accurate, you can rephrase it;  
16 or if you know the answer and you would like to  
17 correct it, feel free.

18 What is an "LSRP," as you understand it?

19 THE WITNESS: An LSRP is a licensed  
20 professional within the State of New Jersey. It's  
21 hired by the responsible party to direct the  
22 investigation and remediation program at a release  
23 site.

24 BY MR. LENDER:

25 Q. And the LSRP, as you understand, essentially

1 steps into the shoes of the DEP. Correct?

2 A. I wouldn't use that phrase. They essentially  
3 take over the oversight. They submit their reports to  
4 the DEP and the DEP on occasion might audit the  
5 report.

6 Q. During the period of time between your original  
7 report and your most recent report, you understand  
8 additional monitoring wells have been installed at the  
9 Livingston site. Correct?

10 A. That's correct.

11 Q. And you also explained during your direct  
12 testimony that natural attenuation will be relied upon  
13 to further clean up the Livingston site. Correct?

14 A. Yes. That would be one of the approaches to  
15 address the contamination at this site.

16 Q. Natural attenuation is the process where through  
17 biodegradation, dilution and other natural processes  
18 contamination gets further reduced. Correct?

19 A. Yes. Either the contaminant penetrations are  
20 essentially diluted or in some areas the  
21 concentrations are actually declining as a result of  
22 degradation.

23 Q. And natural attenuation can occur whether you  
24 are monitoring the natural attenuation or not.  
25 Correct?

1 A. Yes. Natural attenuation processes are natural  
2 processes. However, one only knows if they are  
3 occurring if you actually monitor.

4 Q. To be clear, it's the natural attenuation, not  
5 the monitoring that further cleans up the contaminated  
6 sites. Right?

7 A. The processes that actually result in the  
8 declining concentration are the natural attenuation  
9 processes.

10 Q. So whether we add more monitoring wells or fewer  
11 monitoring wells, natural attenuation still occurs and  
12 occurs at the exact same rate. Correct?

13 A. The processes are still ongoing. We just need  
14 to confirm they are ongoing and at what rate.

15 Q. That's right. It's the natural attenuation, not  
16 the monitoring. Correct?

17 A. The monitoring is confirming it.

18 Q. So adding more monitoring wells will not clean  
19 up the Livingston site any faster. Correct?

20 A. It will not change the rate. It will allow us  
21 to more effectively monitor that the processes are in  
22 fact occurring and occurring appropriately.

23 Q. And adding more monitoring wells, as you have  
24 proposed, will not get the Livingston site to  
25 pre-discharge conditions any faster, and if we don't

1 add those monitoring wells. Correct?

2 A. No. We'll simply understand from the wells  
3 whether it is actually occurring in the expected way.

4 Q. Now, all of the additional investigation and  
5 remediation activities that have occurred at the  
6 Livingston site since you issued your initial report  
7 in 2012 has resulted in significant changes to many of  
8 the opinions presented by you in your original report.  
9 Correct?

10 A. That's correct. Quite a few of the opinions I  
11 presented in 2013 had to be changed in response to the  
12 work performed by ExxonMobil.

13 Q. And as a result, certain things you proposed in  
14 your initial report are now no longer necessary in  
15 your opinion. Correct?

16 A. Either they are no longer necessary or they are  
17 being implemented by ExxonMobil.

18 Q. For example, in your original report you had  
19 recommended that active remediation be expanded to the  
20 northwest of the Livingston site. Correct?

21 A. That is correct. We had recommended a system  
22 that was just on the west side of Livingston Avenue  
23 where historically higher concentrations of MTBE had  
24 been detected just on the east side of Livingston  
25 Avenue.

1 Q. And now you no longer believe that is justified  
2 based on the conditions at the Livingston site.

3 Correct?

4 A. That's correct. The subsequent investigation  
5 performed by ExxonMobil in that area just west of  
6 Livingston Avenue indicated that the concentrations  
7 were much lower than expected; therefore, active  
8 remediation would not be needed.

9 Q. So you are no longer seeking any costs for that  
10 off-site remediation system. Correct?

11 A. That is correct.

12 Q. Now, work has continued to be done to clean up  
13 MTBE in connection with the Livingston site even since  
14 you issued your report in August of 2017. Correct?

15 A. That would be my expectation, yes.

16 Q. And you understand and concede that the dynamic  
17 nature of the contamination plume and remediation  
18 activities at the Exxon Livingston site means that  
19 circumstances at the site are in constant flux.

20 Correct?

21 A. Yes. That's true for any site. Obviously,  
22 there are changing ongoing at any particular release  
23 site with respect to the migration of the  
24 contamination and obviously in relation to any actual  
25 remediation that's ongoing.

1 Q. So that means assuming you are allowed to  
2 testify that the additional steps you have proposed in  
3 your August 2017 report might no longer be necessary  
4 by the time you testify at trial. Right?

5 A. I could not say whether they would or not. It  
6 would depend on data that has been collected  
7 subsequent to the preparation of my 2017 report.  
8 Although I would expect the majority of the  
9 recommendations would still likely be needed.

10 Q. And whatever you might say at a trial, for  
11 example, might no longer be necessary by the time any  
12 appeals run. Correct?

13 A. It would depend upon site conditions. We don't  
14 know at this time what the data might reveal in the  
15 future.

16 Q. For example, it's possible that the LSRP could  
17 decide to do some of the things you are recommending  
18 in your report. Right?

19 A. That is correct. Just as some of the things I  
20 recommended in 2013 were actually implemented.

21 Q. And if that happens, ExxonMobil will be required  
22 to pay for that work. Right?

23 A. That would be my understanding, yes.

24 Q. And if that happens, it could moot some of your  
25 opinions. Right?

1 A. Potentially. I would have to speculate whether  
2 it would or not.

3 Q. In fact, you agree that for a finder of fact to  
4 reach accurate conclusions, it needs to be based on  
5 the most current conditions at the site. Right?

6 A. In an ideal situation, yes. Unfortunately, most  
7 of the cases I'm involved in, there is essentially a  
8 cut-off or else you will be forever updating your  
9 report over and over again every time a new piece of  
10 data was created. And every time you have a report,  
11 then you would have depositions. And by the time you  
12 go to trial, there would be more data. So it would  
13 just run forever. So usually there is a deadline or a  
14 cut-off date imposed.

15 Q. Well, let's look at some of your specific  
16 opinions and see where we go with that.

17 It's your opinion that ExxonMobil should  
18 install additional monitoring wells to assist in the  
19 delineation of MTBE and to further evaluate whether  
20 additional remediation might be required with respect  
21 to Livingston. Correct?

22 A. Yes, that's correct.

23 Q. And you are seeking \$860,000 for the design and  
24 installation of 21 additional wells for that purpose.  
25 Correct?

1 A. Correct, at six discrete cluster locations.

2 Q. And the reason why you believe these additional  
3 monitoring wells should be installed is to further  
4 characterize and delineate the extent of the  
5 contamination. Correct?

6 A. Yes.

7 Q. Now, you understand that remediation falls  
8 within the province of the DEP under its LSRP program.  
9 Correct?

10 A. Yes, that's my understanding.

11 Q. And part of remediation is delineating the  
12 extent of the contamination. Correct?

13 A. Yes. In certain types of projects they refer to  
14 that as the "remedial investigation" because they're  
15 the components of the overall remedial program.

16 Q. In fact, adequately delineating a site falls  
17 directly within the province of the LSRP. Correct?

18 A. My understanding is they would be adequately  
19 delineating, but to the groundwater quality standards.

20 Q. And you understand ExxonMobil is not going to be  
21 allowed to finish its work at Livingston unless and  
22 until the LSRP decides that the site is adequately  
23 delineated. Correct?

24 A. Could you read the question back to me?

25 Q. You understand that ExxonMobil is not going to

1 be allowed to finish its work at the Livingston site  
2 unless and until the LSRP decides that the site is  
3 adequately delineated. Correct?

4 A. That's my understanding of what the LSRP would  
5 be required to do.

6 Q. And ExxonMobil is not going to be allowed to  
7 finish its work at Livingston until it completes all  
8 of the required remediation work as directed by the  
9 LSRP. Correct?

10 A. The remediation work, yes, would be directed by  
11 the LSRP.

12 Q. So if the LSRP believes that 21 additional wells  
13 are necessary to fully delineate the site, it will  
14 require that work be done and ExxonMobil will pay for  
15 it. Correct?

16 A. That would be my assumption, that they would  
17 direct the work to be performed and Exxon would pay  
18 for it.

19 Q. Of course, if the LSRP disagrees with your  
20 assessment, the work presumably will not be directed  
21 to be done at the Livingston site. Correct?

22 A. Unless Exxon elected to voluntarily do that  
23 work.

24 Q. And, of course, another option is your client,  
25 the DEP, could disagree with the LSRP's assessment and

1 they could require the work to be done. Correct?

2 A. I believe they have that authority, yes.

3 Q. So if the DEP, your client, believes 21  
4 additional wells need to be installed to fully  
5 delineate the site, it could direct the LSRP to do  
6 that work?

7 MR. KAUFMANN: Objection, your Honor. Now, he  
8 is asking questions about DEP policy, and I don't  
9 believe that that is the field of Mr. Brown's  
10 expertise.

11 THE COURT: It may not be, but he's asking his  
12 understanding because he's come up with the cost  
13 estimates of what has to be done and compared remedial  
14 issues versus the restoration.

15 So, if you know.

16 And I think he's been answering in the way  
17 that he thinks he understands.

18 MR. LENDER: Thank you.

19 BY MR. LENDER:

20 Q. If the DEP believes that 21 additional wells  
21 need to be installed to fully delineate the site, it  
22 is your understanding that it can direct the LSRP to  
23 do that work. Correct?

24 A. I would say I do not understand the full legal  
25 authority they have. My understanding would be that

1 the oversight agency normally would have some  
2 authority to demand such work if they felt it  
3 necessary.

4 Q. There is an entire regulatory framework for  
5 reviewing sites and determining whether it's  
6 adequately delineated and whether additional  
7 monitoring wells need to be installed. Correct?

8 A. There is, and we have been discussing  
9 essentially the program within the LSRP.

10 Q. And, to your knowledge, to date, your client,  
11 the DEP, has never directed that these additional  
12 wells be installed. Correct?

13 A. I'm not aware of any such direction.

14 Q. And you have never spoken to the LSRP about the  
15 work you think should be done. Right?

16 A. I have not.

17 Q. Now, Mr. Brown, you are aware in March of 2019,  
18 so just two months from now, the LSRP overseeing the  
19 Livingston site is required to file its remediation  
20 investigation report?

21 A. I wasn't aware of that.

22 MR. LENDER: Your Honor, if I could just mark  
23 just so we can get the timing down as Defendant's  
24 Exhibit 1, a document from Kleinfelder, Bates Range  
25 XOM-NJDEP-REM-31310-1073785.

1 (Defendant's Exhibit 1 was marked for  
2 identification.)

3 BY MR. LENDER:

4 Q. Now, Mr. Brown, Exhibit 1 is a document from  
5 Kleinfelder regarding the Livingston site. You can  
6 see that on the first page.

7 If you turn to the third page, do you see  
8 where it says that the initial remedial investigation  
9 report was due in March 1, 2017, and that the revised  
10 date it's now due March 1st, 2019?

11 A. I see that, yes.

12 Q. Thank you.

13 Now, you understand that the remediation  
14 investigation report is a report that the LSRP is  
15 required to submit to the DEP as part of the State's  
16 regulatory framework. Correct?

17 A. That's my understanding.

18 Q. And that report will need to set forth the  
19 delineation for the site. Correct?

20 A. It will need to discuss the nature and extent of  
21 the contamination. It may not address complete  
22 delineation, but it would need to at least comment on  
23 the extent.

24 Q. The report needs to include a detailed  
25 description including the dimensions, contamination,

1 and suspected sources of the contamination. Correct?

2 A. That's my understanding.

3 Q. And the report will also propose a  
4 classification exception area or a CEA. Correct?

5 A. I cannot state for certain. I believe that's my  
6 understanding.

7 Q. You know what a CEA is. Right? You mentioned  
8 earlier that you've reviewed the regulations?

9 A. Yes.

10 Q. And the CEA sets forth the outerbounds of the  
11 plume where all chemicals of concern are below the  
12 water quality standards. Correct?

13 A. That is the intent. It's intended to identify  
14 an area of the groundwater where concentrations within  
15 that area are above the groundwater quality standard.

16 Q. And the CEA also identifies the locations and  
17 identifications of wells and/or sampling points,  
18 including those that represent the farthest  
19 down-gradient extent of the groundwater contamination.  
20 Correct?

21 A. That's the intent behind the CEA with respect to  
22 the groundwater quality water standard, not a  
23 pre-discharge standard.

24 Q. Now, are you aware of whether the LSRP is going  
25 to require that additional monitoring wells be

1 installed as part of the remediation investigation  
2 report?

3 A. I can't say for certain. But I do recall some  
4 discussion about ExxonMobil planning to do some  
5 additional wells after my 2017 report.

6 Q. Okay. And if more monitoring wells are  
7 installed, you would need to revisit your opinions.  
8 Right?

9 A. That would be true of any investigation. I  
10 would need to consider that to see if the new data  
11 affected my opinions in any way. So, for example, if  
12 a new monitoring well was installed and they found  
13 very high concentrations of MTBE because they  
14 intercepted a fracture that contained the  
15 contamination, that obviously would have an impact on  
16 my opinions.

17 Q. And you would also agree ExxonMobil should not  
18 have to pay to do the same work twice. Right?

19 A. I think that's a reasonable position to take.

20 Q. Okay. Now, when the remediation investigation  
21 report is provided to your client just two months from  
22 now, they presumably will read it. Right?

23 A. I cannot speak for my client.

24 Q. And if the DEP believes that the Livingston site  
25 is not fully delineated or believes that additional

1 monitoring wells need to be installed, it can reject  
2 the report or require that they be installed.

3 Correct?

4 A. Well, I cannot say for certain. That would be  
5 my understanding of part of their authority.

6 Q. Thank you.

7 Now, in terms of your proposed 21 additional  
8 wells, you are proposing individual casings for those  
9 wells. Is that correct?

10 A. That is correct. They would be cluster wells.

11 Q. Meaning that for each well you are proposing to  
12 drill a new well. Right?

13 A. That is correct.

14 Q. So just for an example, for one of the places  
15 where maybe you said that there should be five  
16 additional depths, your opinion would require the LSRP  
17 to drill five separate holes. Correct?

18 A. That's correct.

19 Q. And you understand that right now at the  
20 Livingston site they are actually using the FLUTe  
21 system. Right?

22 A. I didn't know whether they are using it right  
23 now. I understand for the wells installed immediately  
24 prior to my 2017 report, they've used the FLUTe  
25 system.

1 Q. And the FLUTe system, I think you mentioned, but  
2 let's be clear, it allows you to drill one bore hole  
3 but then have multiple sample locations. Correct?

4 A. That's correct. You drill a large diameter hole  
5 and you insert a very complex well construction that  
6 allows for depth specific samples to be taken.

7 Q. Now, during your direct examination you  
8 suggested the reason why you didn't recommend using  
9 the FLUTe was because of some concerns you had about  
10 the FLUTe system. Do you remember that testimony?

11 A. I wouldn't say I was concerned specifically  
12 about the FLUTe system. I have some concerns based on  
13 my experience with other similar approaches to doing  
14 multiple sample locations within a single bore hole.

15 Q. Well, to be clear, no one at your company has  
16 actually ever installed and used the FLUTe technology  
17 in a site investigation that you've conducted.  
18 Correct?

19 A. That's correct.

20 Q. And you have no experience installing a  
21 multi-level system like the Westbay system you  
22 mentioned in bedrock. Correct?

23 A. No. My experience of multi-level sampling in  
24 bedrock has always been using cluster wells.

25 Q. Not the FLUTe wells that we have been talking

1 about?

2 A. Correct.

3 Q. And the truth is, the reason why you recommended  
4 installing 21 individual casings in your revised  
5 report rather than a FLUTe system was because you had  
6 recommended individual casings previously. Right?

7 A. Partly. We had recommended them previously, and  
8 that's how ExxonMobil had initially investigated the  
9 contamination.

10 Q. And that's why you recommended doing it again,  
11 because that's what you had recommended before.  
12 Right?

13 A. That's only part of it. I think the existing  
14 investigation performed by ExxonMobil, but also my  
15 experience doing similar investigations at numerous  
16 sites.

17 Q. Now, using the FLUTe system is absolutely an  
18 alternative to installing the individual casings.  
19 Correct?

20 A. Yes.

21 Q. And there is no question that a FLUTe system is  
22 an appropriate technology. Correct?

23 A. Yes, I think it is an appropriate technology.

24 Q. You also concede that a FLUTe system would be  
25 less expensive. Right?

1 A. While I do not have the exact numbers, I don't  
2 anticipate anticipate that even though you are  
3 drilling a larger bore hole and you have multiple  
4 complex completions, it would still be somewhat  
5 cheaper than individual holes.

6 Q. Mr. Brown, you did nothing to cost out the FLUTE  
7 system or how much less expensive it would be than  
8 installing 21 individual casings. Correct?

9 A. I did not.

10 Q. In fact, you have never once costed out a FLUTE  
11 system in bedrock. Right?

12 A. That's correct.

13 Q. And you also did no analysis to determine  
14 whether you could even install additional individual  
15 casings at the locations you have identified. Right?

16 THE COURT: I think you want to put that in  
17 context as to what you mean by whether he could. Do  
18 you mean geographically, geologically, or ownership or  
19 otherwise?

20 MR. LENDER: Fair enough, your Honor.

21 THE COURT: While you are looking for that --  
22 When did the site go to the FLUTE system?

23 MR. LENDER: As far as I know, all of the ones  
24 that are west of the site are all FLUTES. I don't  
25 know the exact date. I can find out.

1           THE COURT: That's okay. But obviously that  
2 was something that was determined by the LSRP and  
3 approved by the DEP?

4           MR. LENDER: Yes, or wasn't objected to by the  
5 DEP.

6           THE COURT: Or not objected to.

7           MR. LENDER: Not that I'm aware of.

8           THE COURT: I'm hearing them shake their heads  
9 "no," but I don't know what that means.

10          MR. KAUFMANN: Either out of ignorance or I  
11 don't know what, there is a misrepresentation of what  
12 the LSRP program does. The DEP, your Honor --

13          THE COURT: Well, I don't want to get into  
14 this now. I'll take it at the end of the hearing if  
15 you want.

16          But I think I need to have some additional  
17 information about this because it's now been made  
18 clear that the FLUTE system is being utilized off-site  
19 to the western part, that it's being done under the  
20 auspices of the LSRP, which is under in some manner  
21 the supervision of the DEP.

22          MR. LENDER: Yes.

23          THE COURT: Well, I see them shaking their  
24 head "no," but I doubt the LSRP is acting without any  
25 authority.

1           So I can have that legal discussion with you,  
2           but it is one that I think is necessary to some of my  
3           consideration.

4           Okay. Let's move on to your questions.

5           BY MR. LENDER:

6           Q.       Mr. Brown, you did no analysis to determine  
7           whether or not there were any access issues with  
8           regard to drilling wells. Correct?

9           THE COURT: In a location that he has  
10          identified?

11          MR. LENDER: Yes.

12          A.       Actually, we've cited five of the proposed six  
13          locations on properties where ExxonMobil had already  
14          obtained access to drill existing locations. Only one  
15          of the locations would be on a new piece of property,  
16          and it may actually be in a public right of way. But  
17          the other locations were all on properties where  
18          ExxonMobil has already obtained assess.

19          Q.       So let's talk about the one where there are no  
20          wells right now.

21                 You did no detailed analysis to access whether  
22          there would be any access issues. Correct?

23          A.       I believe that's why we cited it in the public  
24          right of way.

25          Q.       And further in places where there are FLUTE

1 wells already, there you did no detailed analysis  
2 either; you just assumed that because there is a well  
3 there now, you could drill four or five more. Right?  
4 A. I assumed ExxonMobil had already obtained access  
5 to drill the existing location; therefore, drilling  
6 adjacent to it they would be able to obtain that  
7 access also.

8 Q. That's an assumption that you made, not a  
9 detailed analysis you did. Correct?

10 A. I would say that's an assumption I made, and it  
11 would appear reasonable.

12 Q. Okay.

13 MR. LENDER: Now, if I could I would like to  
14 mark -- this was a figure put up on the screen, but  
15 it's easier to have a copy of it.

16 So I'm going to mark as Defendant's Exhibit 2  
17 a copy of Figure 2 from his report.

18 (Defendant's Exhibit 2 was marked for  
19 identification.)

20 THE COURT: Where is that from?

21 MR. LENDER: This is Figure 2 from his 2017  
22 report, and I believe it was also put in his  
23 PowerPoint.

24 THE COURT: Okay.

25 ///

1 BY MR. LENDER:

2 Q. Now, Mr. Brown, you are familiar with Figure 2  
3 that I just placed before you?

4 A. I am.

5 Q. This is a figure that comes from your recent  
6 August 2017 report?

7 A. That is correct.

8 Q. And this is a map that shows the locations of  
9 where you are proposing that additional monitoring  
10 wells be installed. Correct?

11 A. That's correct.

12 Q. And as you mentioned in most of the instances  
13 you are proposing that additional monitoring wells be  
14 installed at or near the locations where FLUTE  
15 monitoring wells already exist. Correct?

16 A. Some are located adjacent to FLUTE wells and  
17 some are located adjacent to existing cluster wells.

18 Q. Thank you. That's helpful.

19 And for the FLUTE wells that have been  
20 installed, you understand that the LSRP decided on the  
21 depths for the sampling. Correct?

22 A. My understanding would be, yes, that a  
23 consultant working on behalf of ExxonMobil selected  
24 those depths.

25 Q. And you are now proposing that additional wells

1 be installed at different depths than the LSRP has  
2 concluded. Right?

3 A. In some cases, yes. In others, it is different  
4 locations than where the current FLUTE well is, or it  
5 would be for different depths where there are existing  
6 cluster wells. But those cluster wells only monitor  
7 two or three different layers in the subsurface.

8 Q. The LSRP made the judgment to decide that the  
9 monitoring should be at a certain depth, and now you  
10 are here saying you disagree and they should be  
11 monitored at a different depth?

12 A. I wouldn't say "disagree." I evaluated their  
13 data and identified that there are other layers that  
14 need to be monitored at one of the FLUTE well  
15 locations. FLUTE well location 20-D4, I believe there  
16 is a need to collect samples from bedrock layers above  
17 where the FLUTE well currently collects samples.

18 Q. We're going to get to 20-D4 in one minute. I  
19 promise you.

20 But you understand, of course, if the LSRP  
21 ultimately agrees with you, that these additional  
22 depths are needed to fully delineate the site, it can  
23 require that those monitoring wells be installed and  
24 make ExxonMobil pay for it. Right?

25 A. I believe that's the question you posed earlier

1 and I answered yes.

2 Q. Okay. Let me ask you to take a look at  
3 Exhibit 3, which is Figure 5-B from your expert  
4 report, and I believe Mr. Miller also put this up in  
5 his presentation.

6 I'll ask you to take a look at it.

7 (Defendant's Exhibit 3 was marked for  
8 identification.)

9 BY MR. LENDER:

10 Q. Now, Mr. Brown, Figure 5B also comes from your  
11 latest August 2017 report. Correct?

12 A. Yes, it does.

13 Q. And Figure 5B shows the depths that are  
14 currently being monitored for each of the monitoring  
15 wells that are currently installed at the Livingston  
16 site. Correct?

17 A. That is correct.

18 Q. And if we look at 19-D4 as an example, the LSRP  
19 has installed a FLUTe system --

20 THE COURT: Show me where that is. Honestly,  
21 this print is so small. It's difficult for me.

22 MR. LENDER: 19-D4 is the most northern site  
23 on Livingston Avenue. So this one.

24 THE COURT: I see it.

25 Q. For Monitoring Well 19-D4, the LSRP has

1 installed a FLUTe system where MTBE is being sampled  
2 at six different depths. Correct?

3 A. That is correct. There are six sample ports  
4 located within bedrock Zone C and D.

5 Q. Now, if we go back to Exhibit 2, from your  
6 August if 2017 report, you are proposing that five  
7 additional wells be installed slightly north of 19-D4.  
8 Correct?

9 A. Correct.

10 Q. And that's what you refer to as and AQ1.  
11 Correct?

12 A. Yes. That location, AQ1, is the cluster  
13 location that would have five new monitoring depths,  
14 four of which would be above the depth sample at  
15 19-D4, and one would be below.

16 Q. And you included the costs of installing these  
17 five additional monitoring wells in your cost  
18 assessment. Correct?

19 A. Correct.

20 Q. And at the time you prepared your supplemental  
21 report in August of 2017, no one had told you that the  
22 LSRP had already proposed installing additional wells  
23 near 19-D4. Correct?

24 A. That's correct.

25 Q. And you now know that in fact the LSRP has

1 already installed additional wells in this exact area.

2 Right?

3 A. I was aware that additional wells were being  
4 installed. I couldn't say for certain whether it was  
5 this area, as I sit here today.

6 Q. Let me see if I can refresh your recollection  
7 from the declaration you submitted in connection with  
8 the opposition brief in this case.

9 Mr. Brown, this is the declaration that you  
10 submitted in support of plaintiffs' opposition to this  
11 Daubert motion?

12 A. It is, yes.

13 On page 4 it makes reference in paragraph 12  
14 to new monitoring wells that ExxonMobil plans in the  
15 vicinity of 19-D4.

16 Q. Does this, now looking at this declaration,  
17 refresh your recollection that ExxonMobil has in fact  
18 installed additional monitoring wells at the proximate  
19 location of AQ1, and that they were also designed to  
20 collect depth discrete groundwater samples as you  
21 recommended in your expert report?

22 A. Yes. It does appear ExxonMobil at this  
23 particular location is implementing a program  
24 consistent with the recommendations that I made.

25 Q. So because new FLUTE wells have already been

1 installed at this spot, your opinions and the costs  
2 associated with them drop out. Correct?

3 A. I would have to review obviously the data for  
4 the completion of the new monitoring wells and  
5 evaluate the impact that would have upon my current  
6 opinions and my cost estimates for the restoration  
7 program.

8 Q. And since these wells were installed in the last  
9 year and a half, no one provided that information to  
10 you. Correct?

11 A. I have not received it, no.

12 Q. Mr. Brown, isn't the problem with your cost  
13 analysis that if the LSRP agrees with you, you will  
14 make us do the work and could moot your damages claim.  
15 Right?

16 A. I would not say that's the problem with it. I  
17 would have to speculate that they were going to do it.  
18 I do not know, as I sit here, whether they would  
19 implement all of my recommendations.

20 THE COURT: Well, I think the question is  
21 simply, if in fact they are all undertaken and the  
22 work is done, it basically limits your damage  
23 calculations. Correct?

24 THE WITNESS: So, yes. If, for example, the  
25 LSRP or ExxonMobil independently elected to go and

1 install the monitoring locations that I recommended in  
2 my 2017 report, and they were in fact installed, then,  
3 clearly, the costs to do that work would need to be  
4 removed because they have just been done, because  
5 ExxonMobil had decided to do something I recommended.

6 BY MR. LENDER:

7 Q. And, of course, the flip side of that is, if the  
8 LSRP disagrees with you, the work might never be done  
9 because the LSRP could just decide it's unnecessary to  
10 delineate the site. Right?

11 A. Well, if the LSRP elected not to do it, or  
12 ExxonMobil independently elected not to do it, then  
13 based upon the data to date, my recommendations  
14 obviously would still stand. Therefore, I would  
15 believe that work still needs to be done and the cost  
16 associated with that work would still be relevant.

17 Q. Do you agree that it would be wrong and  
18 inconsistent with your opinions for the State to  
19 collect money from ExxonMobil to install monitoring  
20 wells and then not actually install them?

21 A. I don't think I'm in a position to speak for  
22 what NJDEP might do. Clearly, my recommendation is  
23 those wells are needed, and I've developed costs to  
24 install those wells, and my understanding is that's  
25 what the State of New Jersey is trying to recover.

1 How the State would use those funds, that's beyond my  
2 control. I still would believe the wells are needed.

3 Q. Is there a scenario in your mind where the State  
4 could actually collect damages from ExxonMobil, and  
5 then the LSRP requires us to put those same wells in,  
6 then we're paying for the same twice?

7 A. I can't answer that.

8 THE COURT: We're dealing with his opinions,  
9 and the issues you are raising are things I will deal  
10 with at some point in time, but they don't go to the  
11 validity of his opinions. He's giving opinions of  
12 what he thinks are necessary.

13 MR. LENDER: Fair enough, your Honor. Thank  
14 you.

15 THE COURT: I understand the points you would  
16 like to make before me today, but it may not be  
17 through this witness.

18 MR. LENDER: Fair enough. Thank you, your  
19 Honor.

20 BY MR. LENDER:

21 Q. Let me now move to the next main opinion which  
22 is the additional \$730,000 you are seeking to sample  
23 monitoring wells for the next five years. Okay?

24 A. Yes. That would be the ongoing monitoring  
25 program.

1 Q. Essentially, your position back in August of  
2 2017, when you issued your revised report was that  
3 on-site active remediation should continue you reached  
4 asymptotic conditions, and after that you should  
5 proceed to MNA for at least five years?

6 A. Yes. That sounds correct.

7 Q. And asymptotic conditions are reached when you  
8 basically are no longer recovering contaminant at an  
9 appreciable amount by using the active remediation  
10 system?

11 A. That is correct. You may recall earlier I said  
12 there comes a point where the active remediation is no  
13 more effective than allowing monitored natural  
14 attenuation to then supplement that work.

15 Q. At that point what you do is, you shut down the  
16 on-site system and just do monitored natural  
17 attenuation or MNA. Correct?

18 A. That is what I'm proposing, yes.

19 Q. Your opinion is that monitored natural  
20 attenuation combined with the ongoing operation of the  
21 pump and treat for a short period of time will  
22 ultimately achieve pre-discharge conditions and that  
23 MNA for a period of five years or slightly longer will  
24 be able to demonstrate that. Correct?

25 MR. MILLER: Objection; compound.

1 THE COURT: You can break it up.

2 MR. LENDER: That's actually a direct quote  
3 from his deposition. That's how he said it.

4 THE COURT: If you want to just say, is your  
5 opinion still today what it was at your deposition  
6 that -- and phrase the question.

7 MR. LENDER: Okay.

8 BY MR. LENDER:

9 Q. Is it your opinion still today, as you said at  
10 your deposition, that monitored natural attenuation  
11 combined with the ongoing operation of pump and treat  
12 for a short period of time will ultimately achieve  
13 pre-discharge conditions and that MNA for a period of  
14 five years or slightly longer will be able to  
15 demonstrate that?

16 A. Based upon the data that I have reviewed up  
17 through the preparation of my expert report, yes,  
18 that's what I concluded.

19 Q. So basically you stopped active remediation when  
20 you hit asymptotic conditions, and then you rely on  
21 natural attenuation to finish the cleanup and you  
22 monitor the natural attenuation. Right?

23 A. Yes, that's correct.

24 Q. Now, you know, sitting here today, that the LSRP  
25 has approved that the on-site system be turned off

1 precisely because it was at asymptotic conditions.

2 Correct?

3 A. I don't recall definitively as I sit here today,  
4 but that sounds correct.

5 Q. Let's see if we can refresh your recollection  
6 one more time.

7 Mr. Brown, I'm handing you a copy of the  
8 second declaration you filed in connection with the  
9 Daubert motions in this case, and if you could turn to  
10 paragraph 17, and let's see if that refreshes your  
11 recollection that the pump and treat was turned off  
12 because it had reached asymptotic conditions?

13 A. Yes. I see that now. ExxonMobil planned to  
14 shut down the system on August 30, 2017.

15 Q. And given that, now it's your opinion that MNA  
16 should take place for at least five years. Right?

17 A. That's correct.

18 Q. It may be a little more than that. But you  
19 think five years of MNA is a reasonable timeframe.  
20 Correct?

21 A. I did, yes. You may recall that we did analysis  
22 of various rates of degradation and determined that  
23 MNA would take between five and seven years.  
24 Therefore, we conservatively took the shorter time  
25 period.

1 THE COURT: Would it be that the five years  
2 actually began on August 30, 2017?

3 THE WITNESS: Essentially, yes.

4 THE COURT: So we're essentially 1 1/2 years  
5 in?

6 THE WITNESS: Yes. Obviously, the program may  
7 run longer if the natural attenuation processes are  
8 slower.

9 THE COURT: Right. But you were working with  
10 the five years. So it's actually begun.

11 THE WITNESS: Yes.

12 BY MR. LENDER:

13 Q. So it's your opinion we will ultimately achieve  
14 pre-discharge conditions and that MNA for five years  
15 or slightly longer will be able to demonstrate that.  
16 Right?

17 A. That is my opinion and I think my hope.

18 Q. And that's the reason why your cost analysis  
19 includes five years of monitoring. Correct?

20 A. As I said, we elected to choose five years based  
21 upon the analysis that we did for the likely rates of  
22 degradation, and five years would be the minimum time.  
23 It may be longer, but I'm hoping not much longer.

24 Q. At the conclusion of five years of MNA,  
25 according to your opinions, ExxonMobil might be done

1 at the Livingston site. Right?

2 A. There is a chance of that, yes.

3 Q. And, again, just so we're all clear, it's the  
4 natural attenuation that's going to get us there.  
5 Right?

6 A. It's the natural processes that actually result  
7 in the reduction of transportations as confirmed by  
8 the monitoring.

9 Q. In fact, there is no question in your mind that  
10 the remediation program at Livingston has helped  
11 groundwater to its pre-discharge condition. Correct?

12 A. There is no question that the work implemented  
13 by ExxonMobil, specifically their remediation program,  
14 has assisted in reducing the concentrations that  
15 hopefully will ultimately achieve a pre-discharge  
16 condition.

17 Q. In your opinion, though, to be clear, the  
18 remediation program at the Exxon service site helped  
19 restore groundwater to its baseline condition.  
20 Correct?

21 A. Yes, that sounds consistent with what I offered  
22 at my deposition testimony.

23 Q. And "baseline," just so we're clear, you mean  
24 pre-discharge conditions. Right?

25 A. That is what I meant, yes.

1 Q. Now, you understand that there are currently  
2 over 50 monitoring locations in connection with the  
3 Livingston site. Correct?

4 A. That's my understanding. Approximately that  
5 number.

6 Q. And as we discussed, you are proposing to add 21  
7 more screened intervals. Right?

8 A. Yes. But as we discussed, we know that  
9 ExxonMobil has already installed some of those  
10 locations near 19-D4.

11 Q. Right. So your cost estimate is going to have  
12 to be adjusted to account for that. Right?

13 A. That is correct. Once I review that data, if it  
14 appears that they have completed a monitoring program  
15 that is consistent with my recommendation, then there  
16 would be no need to drill an additional cluster well  
17 in that location.

18 Q. Now, the \$730,000 you have included in your  
19 damages assessment covers the cost not just for  
20 monitoring the 21 new wells you are seeking to get  
21 installed, but also the existing wells that the LSRP  
22 is currently monitoring and sampling. Correct?

23 A. Correct.

24 Q. So 70 percent of the cost associated with your  
25 \$730,000 alleged damages number relates to the

1 existing monitoring wells. Right?

2 A. Yes. The ongoing monitoring of those existing  
3 wells.

4 Q. So your \$730,000 amount, only around 220,000 is  
5 attributed to monitoring the 21 new wells you are  
6 proposing to install over the next five years. Right?

7 A. I don't know the exact number. But that would  
8 seem to be a reasonable division of those costs, yes.

9 Q. And you understand and you understood this when  
10 you issued your report that the LSRP has been  
11 requiring that existing wells be monitored, and that's  
12 being paid for by ExxonMobil. Right?

13 A. That's my understanding, yes.

14 Q. So if ExxonMobil would continue to pay for  
15 monitoring the existing wells going forward, the  
16 510,000 would actually already be accounted for and  
17 should not be included in your damages calculation.  
18 Right?

19 A. If ExxonMobil had somehow legally committed to  
20 do that work, then I would not obviously look to  
21 recover funds to duplicate work.

22 Q. And even though you knew that the LSRP was  
23 requiring monitoring of the existing wells, you  
24 included the full amount of monitoring all the wells  
25 in your cost calculation. Right?

1 A. I did. So all of the costs of the monitoring  
2 moving forward irrespective of who might actually do  
3 it, I assumed that in the case of the costs it would  
4 have to be done.

5 Q. But for the ongoing cost associated with the  
6 pump and treat, until it was turned off, because of  
7 asymptotic, you knew ExxonMobil was paying for that  
8 but you excluded those costs. Right?

9 A. Correct. I could see that ExxonMobil was  
10 continuing to do that. Therefore, I did not include  
11 that.

12 Q. So you treated the pump and treat costs  
13 differently than the monitoring costs?

14 A. Yes. I understood from my review of the  
15 documentation that ExxonMobil was committed to  
16 continuing to operate the on-site pump and treat  
17 system. And I understood they would be doing some  
18 ongoing monitoring, but I did not see anything to  
19 confirm for how long they would be doing that.

20 Q. And as we discussed just a moment ago, the LSRP  
21 has already required the installation of monitoring  
22 wells north of 19-D4. Right?

23 A. They have. They made a decision consistent with  
24 my recommendation in that area to install additional  
25 monitoring points.

1 Q. And they've required those monitoring wells also  
2 be monitored. Right?

3 A. I cannot say for certain, but I would assume  
4 that to be the case.

5 Q. So those would be additional monitoring costs  
6 that should be taken out of your cost estimate.  
7 Right?

8 A. They would be if there was some legal commitment  
9 to do that work that I felt confident that it would be  
10 done.

11 Q. And, of course, if the LSRP decides to install  
12 additional wells in the future and those are  
13 monitored, that too could cut into your monitoring  
14 cost assessment. Right?

15 A. Yes, it could. Obviously, if they, say, for  
16 example, elected to install some of the other  
17 monitoring wells that I recommended, then, clearly, I  
18 would not look to duplicate their work. But I would  
19 have to obviously review that work to ensure that the  
20 work had actually been done and not just promised.

21 Q. Mr. Brown, sitting here today, you don't  
22 actually know how much of the \$730,000 you included  
23 for monitoring costs over a five-year period will turn  
24 out to be duplicative. Correct?

25 A. I do not because I do not know for certain

1 exactly what ExxonMobil plans to do with respect to  
2 that number.

3 Q. Now, Mr. Brown, after the LSRP files its  
4 remediation investigation report in March of 2019, you  
5 understand that the LSRP will be required to file its  
6 remedial action report and seek a remedial action  
7 permit from the DEP by March 2024. Correct?

8 A. I don't recall the specific date, but that does  
9 sound reasonable.

10 Q. And the remediation investigation report may  
11 update the CEA based on any new data that the LSRP  
12 has. Right?

13 A. It may.

14 Q. And the remediation action permit will contain a  
15 proposal for future MNA and for how long MNA should  
16 continue. Correct?

17 A. It may.

18 Q. Okay. It may.

19 And you understand that the DEP needs to  
20 approve the remedial action permit which will identify  
21 the wells to be monitored going forward for MNA and at  
22 what frequency. Right?

23 A. I do not know the specific legal approval  
24 authorities of DEP with respect to that specific issue  
25 as I sit here.

1 MR. LENDER: Your Honor, we could either  
2 submit the regs and show this to you because the regs  
3 say what they say or I could go through them with him.

4 THE COURT: No. I would rather do it after.  
5 I'm going to permit everyone to have a, not lengthy,  
6 but a final written summation you can give me after  
7 this hearing and you could include those kinds of  
8 things there. I don't think it's a good use of our  
9 time to do that with him.

10 MR. LENDER: I didn't either. That's why I  
11 wanted to check. Thank you.

12 BY MR. LENDER:

13 Q. Mr. Brown, you understand that MNA cannot be  
14 authorized for use at the site until the contamination  
15 is adequately characterized and delineated. Right?

16 A. Actually, that's not quite true. Monitored  
17 natural attenuation is being conducted now and it's  
18 even conducted while the remediation system is  
19 operating. We are monitoring the groundwater  
20 conditions at the site and monitoring natural  
21 attenuation.

22 So it's an ongoing process. It isn't  
23 something that only starts at the end of the active  
24 remediation, the actual pump and treat. What I'm  
25 recommending is five years after it continues.

1 Q. Your opinion, as the Judge said, starting in  
2 August of 2017, we are now in a five-year period of  
3 MNA?

4 A. At this particular site, yes.

5 Q. But you know that in fact at the site MNA is  
6 going to occur for much longer than five years.  
7 Right?

8 A. MNA or natural attenuation itself?

9 Q. MNA and natural attenuation.

10 A. Potentially. I do not know what they would  
11 recommend within their reports. But there is the  
12 potential that it could be recommended to continue for  
13 longer than that.

14 Q. Now, Mr. Brown, the third thing that you had  
15 recommended in your latest report is that a system be  
16 designed and permitted for Public Water Supply No. 11  
17 in the event that MTBE is detected in that well in the  
18 future. Correct?

19 A. That is one of the recommendations that I made  
20 within my report. But my understanding is that claim  
21 is being withdrawn.

22 Q. Yesterday your side abandoned that claim.  
23 Correct?

24 A. My understanding is they withdrew the claim for  
25 the \$70,000.

1 Q. And you had mentioned in response to a question  
2 from Mr. Miller that there has been no MTBE detected  
3 at Public Water Supply No. 11 and I wrote down in the  
4 last few years. That's what you said. Right?

5 A. That's my understanding.

6 Q. In fact, your understanding is that since 2009  
7 Public Water Supply No. 11 has been sampled 28 times  
8 and MTBE has been non-detect in every single one of  
9 them. Right?

10 A. That's my understanding, yes.

11 Q. So it's not just the last few years; it's almost  
12 a decade. Correct?

13 A. That sounds correct, yes.

14 Q. And, by the way, for the other two receptors you  
15 identified in response to some questions from  
16 Mr. Miller, to be clear, your side is not seeking any  
17 damages to clean up those receptors. Right?

18 A. That's correct. I don't believe my client is  
19 seeking any damages for those.

20 Q. The last thing you mentioned is that you are  
21 seeking a contingency of \$247,000, which now may be a  
22 little less, to account for the drop-off of the  
23 permit?

24 A. Correct.

25 Q. Basically, you added a 15 percent kicker on top

1 of the cost estimates. Right?

2 A. I've added the contingency, as I discussed  
3 earlier, because of the inherent uncertainties in  
4 implementing the type of program I'm recommending.

5 Q. And nowhere in your report do you provide any  
6 calculation of how you came up with that 15 percent  
7 number. Right?

8 A. Actually, I believe we do. For the sites we  
9 evaluated we used a contingency based on EPA's  
10 calculations of contingency for estimates, such as the  
11 ones we prepared. And because of the limited scope of  
12 work and the limited amount of remediation that were  
13 proposed for Exxon, we actually reduced that  
14 percentage, as we felt there was a higher degree of  
15 confidence in the cost for the ExxonMobil site.

16 Q. So your testimony is that in your report I'll  
17 find a sheet of paper that calculates, comes up with  
18 how you came up with the 15 percent number. That's  
19 your testimony?

20 A. I don't know if there's a piece of paper. There  
21 will be an indication as to the percentage.

22 Q. It said 15 percent. But you said earlier that's  
23 calculated based on using EPA guidance.

24 My question to you is, if I look through your  
25 reports, will I see anywhere a document that shows how

1 you came up with the 15 percent number?

2 A. The document will show how we came up with a  
3 larger percentage. But for this particular site we  
4 felt that percentage was too high.

5 Q. So you think there's a sheet of paper that lays  
6 out that calculation in your report?

7 A. There is a sheet of paper that lays out the  
8 calculation for the contingency we applied for sites  
9 where we were recommending active remediation that was  
10 not being performed by the responsible party.

11 Q. So not for the Livingston site then?

12 A. For the Livingston site we actually looked on a  
13 site-specific basis and said, Well, we have a much  
14 more defined scope here as to what's going to be done,  
15 and we're not recommending any active remediation  
16 other than ExxonMobil continue to operate their  
17 current system. Therefore, we felt the contingency  
18 that would apply to other sites didn't need to be as  
19 large for this site.

20 Q. And the reason why you are seeking this  
21 contingency in the case is that things cost more than  
22 you have proposed. Right?

23 A. Yes. Obviously, I'm sure you are aware that  
24 when you drill a monitoring well, one gets an estimate  
25 as to what that well might cost. But in the field

1 you could come across issues where the bedrock is more  
2 confident. Therefore, the drilling takes longer, so  
3 the costs are greater.

4 There are other issues that occur whenever one  
5 is doing a remedial investigation or remedial  
6 implementation program that requires you to have some  
7 contingency for those uncertainties.

8 Q. And, of course, because a lot of the wells are  
9 being drilled in places where there already are wells,  
10 it's possible that it might cost what you've proposed  
11 or even less than what you've proposed. Right?

12 A. I would be very surprised if it cost less  
13 because we actually obtained fixed prices from the  
14 driller, and my experience with drillers is they don't  
15 give you a discount if it takes them less. They still  
16 charge you their bid. Obviously, if they think  
17 conditions have changed, they issue a change order to  
18 get more money.

19 Q. And if the DEP makes us do the work, there will  
20 be no need for a contingency. Right?

21 A. If ExxonMobil elects to do the work, then  
22 obviously I would not be seeking to recover the cost  
23 to do that work or the related contingency, just as  
24 we've removed the 60,000 for the well and treatment  
25 system and the contingency associated with that.

1 MR. LENDER: Your Honor, my colleague said he  
2 needed about 30 minutes.

3 THE COURT: Are you going to need more than 30  
4 minutes?

5 MR. TULLY: Maybe

6 THE COURT: I have a suggestion actually  
7 because I think I'm going to want to speak with the  
8 attorneys when this is all complete. I won't have  
9 time to do that today. I'm not trying to press you to  
10 do your 30 minutes and be done, particularly if there  
11 is anything else we want to cover.

12 I know we had put aside the days. I would  
13 really prefer if you come back tomorrow morning and we  
14 spend the morning. We're not going to need more than  
15 the morning. You can do your examination then. We  
16 could fill in on anything else that we need.

17 I certainly want to have some discussion with  
18 the lawyers about the Livingston site off the record  
19 in chambers tomorrow. So I would like that  
20 opportunity.

21 MR. LENDER: Thank you.

22 THE COURT: You are all planning to be here  
23 tomorrow anyway. Right?

24 MR. MILLER: Yes, your Honor.

25 MR. TULLY: Will you also entertain brief oral

1 arguments on the motions?

2 THE COURT: I may do that. I thought I would  
3 let you do it in written form. But I have the time  
4 now to do it, if you want to do it tomorrow and you  
5 don't have to submit anything else in writing, that's  
6 fine too. So if you all want to be ready to do that,  
7 not long, that's fine, we can do that and you can  
8 prepare for that tonight then for tomorrow.

9 You can step down. You are excused.

10 I'll see you tomorrow morning at 10:00.

11 THE WITNESS: Thank you.

12 (Witness excused for the day.)

13 THE COURT: May I see counsel for just one  
14 moment off the record.

15 (Off-the-record discussion.)

16 (Court adjourned at 3:30 p.m.)

17 ///

18

19

20

21

22

23

24

25

I N D E X

<u>Witness</u>	<u>Direct</u>	<u>Cross</u>	<u>Redirect</u>	<u>Recross</u>
----------------	---------------	--------------	-----------------	----------------

**Anthony Brown**

By Mr. Miller	6	--		
By Mr. Lender	--	124		

<u>Exhibits</u>	<u>For Identification</u>	<u>In Evidence</u>
-----------------	---------------------------	--------------------

NJDEP D-1	136	
NJDEP D-2	145	
NJDEP D-3	148	

**C E R T I F I C A T E**

I, **Vincent Russoniello**, Official United States Court Reporter and Certified Court Reporter of the State of New Jersey, do hereby certify that the foregoing is a true and accurate transcript of the proceedings as taken stenographically by and before me at the time, place and on the date hereinbefore set forth.

I do further certify that I am neither a relative nor employee, nor attorney, nor counsel of any of the parties to this action, and that I am neither a relative nor employee of such attorney or counsel and that I am not financially interested in this action.

S/Vincent Russoniello

Vincent Russoniello, CCR

Certificate No. 675

	<b>15-6468</b> [1] - 1:2 <b>15-year</b> [1] - 77:15 <b>150</b> [1] - 25:20 <b>1500</b> [1] - 112:7 <b>159,449</b> [1] - 100:13 <b>17</b> [3] - 77:16, 108:6, 160:10 <b>1700</b> [1] - 71:25 <b>19</b> [4] - 16:23, 110:15, 110:20, 125:21 <b>19-D4</b> [9] - 152:18, 152:22, 152:25, 153:7, 153:15, 153:23, 154:15, 163:10, 165:22 <b>1934</b> [2] - 64:19, 64:20 <b>1970s</b> [1] - 65:2 <b>1988</b> [1] - 8:25 <b>1990s</b> [3] - 9:17, 37:24, 38:1 <b>1992</b> [1] - 9:4 <b>1999</b> [3] - 112:13, 112:22, 113:21 <b>19th</b> [1] - 51:5 <b>1:10</b> [1] - 92:11 <b>1st</b> [1] - 140:10	134:20 <b>2016</b> [2] - 77:18, 78:7 <b>2017</b> [49] - 6:7, 26:25, 77:18, 78:4, 80:11, 83:9, 93:19, 93:20, 94:1, 94:2, 94:8, 96:13, 96:24, 97:2, 107:15, 107:22, 107:24, 108:2, 108:12, 110:23, 117:7, 118:8, 118:23, 118:25, 119:4, 119:8, 123:21, 124:9, 125:11, 126:20, 126:23, 126:25, 128:23, 133:14, 134:3, 134:7, 140:9, 142:5, 143:24, 149:21, 150:6, 152:11, 153:6, 153:21, 156:2, 158:2, 160:14, 161:2, 169:2 <b>2019</b> [4] - 1:5, 139:17, 140:10, 167:4 <b>2024</b> [1] - 167:7 <b>21</b> [11] - 85:25, 135:24, 137:12, 138:3, 138:20, 143:7, 145:4, 146:8, 163:6, 163:20, 164:5 <b>220,000</b> [1] - 164:4 <b>234,000</b> [1] - 77:20 <b>247</b> [1] - 100:22 <b>28</b> [2] - 3:7, 170:7 <b>2:00</b> [1] - 128:2	<b>5</b> <b>5</b> [4] - 6:11, 64:10, 106:21, 113:25 <b>5-B</b> [1] - 152:3 <b>50</b> [4] - 29:10, 69:1, 99:6, 163:2 <b>500</b> [1] - 25:24 <b>510,000</b> [1] - 164:16 <b>59</b> [1] - 97:5 <b>59,000</b> [1] - 97:19 <b>5B</b> [2] - 152:10, 152:13
<b>0</b>			<b>6</b> <b>6</b> [2] - 86:8, 176:6 <b>60,000</b> [1] - 173:24 <b>609)588-9516</b> [1] - 1:25 <b>675</b> [1] - 177:21
<b>08608</b> [1] - 1:11			<b>7</b> <b>7</b> [1] - 112:23 <b>70</b> [8] - 40:3, 40:12, 59:15, 99:4, 101:4, 101:8, 123:8, 163:24 <b>730</b> [1] - 100:22 <b>730,000</b> [2] - 100:11, 100:18 <b>74</b> [1] - 78:4 <b>74.3</b> [1] - 78:8 <b>753</b> [1] - 3:7
<b>1</b>			<b>8</b> <b>8,000</b> [1] - 111:2 <b>81,000</b> [1] - 120:15 <b>860</b> [1] - 100:22 <b>860,000</b> [1] - 100:9
<b>1</b> [13] - 1:6, 6:8, 33:19, 39:17, 55:12, 77:22, 101:5, 120:22, 139:24, 140:1, 140:4, 140:9, 161:4 <b>1/2</b> [1] - 161:4 <b>10</b> [2] - 43:17, 43:25 <b>10,000</b> [3] - 97:20, 97:24, 116:23 <b>100</b> [5] - 11:18, 25:21, 36:5, 40:3, 51:10 <b>10:00</b> [1] - 175:10 <b>11</b> [34] - 23:3, 66:18, 67:6, 67:20, 68:10, 68:15, 70:16, 70:22, 71:8, 71:12, 71:17, 71:19, 71:24, 72:13, 72:16, 72:25, 73:3, 75:20, 76:5, 76:7, 76:14, 83:12, 83:19, 84:1, 84:8, 85:5, 85:14, 85:18, 87:21, 121:18, 169:16, 170:3, 170:7 <b>11,000</b> [1] - 66:1 <b>12</b> [3] - 17:18, 45:15, 154:13 <b>124</b> [1] - 176:6 <b>13</b> [1] - 42:6 <b>136</b> [1] - 176:11 <b>14</b> [3] - 42:5, 42:7, 116:23 <b>14,000</b> [1] - 114:4 <b>145</b> [1] - 176:12 <b>148</b> [1] - 176:12 <b>15</b> [13] - 23:3, 42:6, 45:15, 65:17, 65:18, 65:20, 98:16, 100:20, 170:25, 171:6, 171:18, 171:22, 172:1	<b>2</b> <b>2</b> [8] - 6:8, 39:18, 149:16, 149:17, 149:18, 149:21, 150:2, 153:5 <b>2,500,000</b> [2] - 113:20, 120:17 <b>2-D</b> [1] - 114:8 <b>20</b> [3] - 68:25, 86:17, 95:24 <b>20-D4</b> [2] - 151:15, 151:18 <b>2003</b> [1] - 77:23 <b>2009</b> [1] - 170:6 <b>2012</b> [6] - 16:21, 114:2, 114:7, 126:18, 128:19, 132:7 <b>2013</b> [35] - 6:7, 26:25, 79:6, 79:22, 80:11, 82:7, 82:9, 82:12, 82:24, 83:7, 85:17, 86:15, 86:21, 90:24, 93:25, 94:1, 96:16, 96:17, 96:22, 108:1, 114:8, 116:2, 116:8, 117:5, 118:23, 119:3, 124:3, 124:8, 125:9, 125:25, 126:15, 127:17, 128:19, 132:11,	<b>3</b> <b>3</b> [6] - 6:11, 64:10, 70:9, 113:13, 152:3, 152:7 <b>3,500</b> [1] - 9:10 <b>30</b> [6] - 67:2, 160:14, 161:2, 174:2, 174:3, 174:10 <b>300</b> [1] - 25:25 <b>32</b> [1] - 125:20 <b>350</b> [1] - 83:24 <b>38</b> [1] - 70:25 <b>3:30</b> [1] - 175:16	<b>9</b> <b>9</b> [2] - 1:5, 76:24 <b>90</b> [1] - 76:2
		<b>4</b> <b>4</b> [5] - 6:11, 56:18, 64:9, 64:10, 154:13 <b>40</b> [5] - 65:12, 95:16, 110:4, 110:6, 110:12 <b>400</b> [1] - 83:24 <b>402</b> [1] - 1:11 <b>45</b> [2] - 16:7, 16:9	<b>A</b> <b>abandoned</b> [1] - 169:22 <b>abbreviated</b> [2] - 51:21, 87:25 <b>abbreviation</b> [2] - 113:24, 115:11 <b>ability</b> [3] - 15:23, 32:11, 32:16 <b>able</b> [10] - 7:11, 47:15, 54:4, 84:22, 96:5, 119:1,

<p>149:6, 158:24, 159:14, 161:15</p> <p><b>ABOVE</b> [1] - 3:10</p> <p><b>ABOVE-ENTITLED</b> [1] - 3:10</p> <p><b>above-ground</b> [1] - 64:2</p> <p><b>absolutely</b> [3] - 21:17, 35:11, 145:17</p> <p><b>absorb</b> [4] - 35:22, 36:15, 43:4, 81:9</p> <p><b>absorbs</b> [2] - 36:21, 81:1</p> <p><b>absorption</b> [1] - 35:24</p> <p><b>acceptable</b> [2] - 28:24, 29:21</p> <p><b>accepted</b> [3] - 11:3, 12:5, 102:13</p> <p><b>access</b> [7] - 96:5, 148:7, 148:14, 148:21, 148:22, 149:4, 149:7</p> <p><b>accomplish</b> [1] - 62:10</p> <p><b>according</b> [1] - 161:25</p> <p><b>account</b> [3] - 93:21, 163:12, 170:22</p> <p><b>accounted</b> [1] - 164:16</p> <p><b>accumulated</b> [2] - 43:15, 43:17</p> <p><b>accumulating</b> [2] - 42:25, 62:20</p> <p><b>accumulation</b> [2] - 52:15, 53:6</p> <p><b>ACCURATE</b> [1] - 3:8</p> <p><b>accurate</b> [3] - 129:15, 135:4, 177:6</p> <p><b>accurately</b> [1] - 47:15</p> <p><b>achieve</b> [5] - 55:10, 158:22, 159:12, 161:13, 162:15</p> <p><b>achieved</b> [1] - 39:4</p> <p><b>acknowledged</b> [1] - 85:17</p> <p><b>acquisitions</b> [1] - 9:12</p> <p><b>acronym</b> [2] - 42:13, 90:8</p> <p><b>Act</b> [2] - 22:18, 22:22</p> <p><b>acting</b> [2] - 10:14, 147:24</p> <p><b>ACTION</b> [1] - 1:2</p> <p><b>action</b> [8] - 57:15, 82:3, 167:6, 167:14, 167:20, 177:12, 177:14</p> <p><b>Action</b> [1] - 88:3</p> <p><b>actions</b> [7] - 72:6, 72:8, 72:9, 72:14, 91:2, 91:5, 96:22</p>	<p><b>activated</b> [3] - 80:25, 81:9, 99:8</p> <p><b>active</b> [17] - 59:11, 59:16, 59:21, 78:11, 91:15, 117:12, 132:19, 133:7, 158:3, 158:9, 158:12, 159:19, 168:23, 172:9, 172:15</p> <p><b>actively</b> [1] - 72:10</p> <p><b>activities</b> [6] - 79:24, 113:15, 114:13, 117:18, 132:5, 133:18</p> <p><b>actual</b> [10] - 11:4, 19:4, 20:12, 25:19, 26:20, 33:10, 63:9, 111:13, 133:24, 168:24</p> <p><b>adage</b> [2] - 35:1, 113:7</p> <p><b>add</b> [5] - 22:18, 65:6, 131:10, 132:1, 163:6</p> <p><b>added</b> [9] - 22:15, 65:1, 65:2, 65:3, 65:5, 99:19, 125:2, 170:25, 171:2</p> <p><b>adding</b> [6] - 99:21, 99:22, 100:10, 100:21, 131:18, 131:23</p> <p><b>addition</b> [7] - 8:7, 21:18, 22:11, 30:1, 80:4, 82:8, 105:3</p> <p><b>additional</b> [50] - 32:20, 32:23, 79:23, 80:5, 84:5, 84:15, 86:20, 87:13, 95:13, 96:15, 96:18, 97:11, 112:14, 119:4, 120:23, 127:17, 130:8, 132:4, 134:2, 135:18, 135:20, 135:24, 136:2, 137:12, 138:4, 138:20, 139:6, 139:11, 141:25, 142:5, 142:25, 143:7, 143:16, 146:14, 147:16, 150:9, 150:13, 150:25, 151:21, 153:7, 153:17, 153:22, 154:1, 154:3, 154:18, 157:22, 163:16, 165:24, 166:5, 166:12</p> <p><b>address</b> [11] - 57:18, 57:22, 58:18, 59:7, 78:16, 78:18, 86:1, 90:6, 122:2, 130:15, 140:21</p> <p><b>addressed</b> [3] - 23:23, 32:18, 91:17</p> <p><b>addresses</b> [1] - 98:13</p> <p><b>addressing</b> [3] - 59:21,</p>	<p>67:3, 88:11</p> <p><b>adequately</b> [6] - 136:16, 136:18, 136:22, 137:3, 139:6, 168:15</p> <p><b>adjacent</b> [3] - 149:6, 150:16, 150:17</p> <p><b>adjourned</b> [1] - 175:16</p> <p><b>adjust</b> [2] - 100:15, 108:22</p> <p><b>adjusted</b> [2] - 22:11, 163:12</p> <p><b>administration</b> [1] - 12:17</p> <p><b>administrative</b> [1] - 88:16</p> <p><b>advance</b> [2] - 69:18, 83:2</p> <p><b>advanced</b> [1] - 83:8</p> <p><b>advantage</b> [1] - 50:24</p> <p><b>advice</b> [1] - 9:20</p> <p><b>advise</b> [1] - 12:16</p> <p><b>aerial</b> [1] - 66:3</p> <p><b>aerobic</b> [4] - 60:13, 60:20, 62:11, 63:8</p> <p><b>affect</b> [2] - 15:23, 50:18</p> <p><b>affected</b> [1] - 142:11</p> <p><b>affidavit</b> [1] - 108:8</p> <p><b>afternoon</b> [2] - 93:12, 93:13</p> <p><b>agencies</b> [1] - 9:21</p> <p><b>agency</b> [2] - 26:4, 139:1</p> <p><b>ago</b> [2] - 104:11, 165:20</p> <p><b>agree</b> [5] - 69:13, 82:3, 135:3, 142:17, 156:17</p> <p><b>agrees</b> [2] - 151:21, 155:13</p> <p><b>ahead</b> [2] - 29:17, 106:17</p> <p><b>Air</b> [2] - 22:17, 22:22</p> <p><b>air</b> [6] - 62:7, 62:8, 62:13, 117:24, 118:1</p> <p><b>al</b> [2] - 1:5, 1:7</p> <p><b>alcohol</b> [2] - 22:14, 28:4</p> <p><b>alcohol-based</b> [1] - 22:14</p> <p><b>alleged</b> [1] - 163:25</p> <p><b>allow</b> [7] - 17:24, 30:5, 55:19, 95:1, 95:6, 109:16, 131:20</p> <p><b>allowed</b> [7] - 69:10, 88:16, 108:17, 134:1, 136:21, 137:1, 137:6</p> <p><b>allowing</b> [1] - 158:13</p> <p><b>allows</b> [4] - 65:9, 74:19, 144:2, 144:6</p>	<p><b>almost</b> [7] - 9:18, 37:1, 76:1, 77:16, 83:25, 87:20, 170:11</p> <p><b>alternative</b> [1] - 145:18</p> <p><b>amendments</b> [2] - 22:18, 22:23</p> <p><b>AMERADA</b> [1] - 1:7</p> <p><b>Americas</b> [1] - 9:13</p> <p><b>amount</b> [11] - 9:16, 72:22, 97:14, 97:22, 100:9, 109:11, 111:1, 158:9, 164:4, 164:24, 171:12</p> <p><b>AN</b> [1] - 3:8</p> <p><b>anaerobic</b> [3] - 60:15, 60:22, 60:25</p> <p><b>analogy</b> [1] - 44:8</p> <p><b>analysis</b> [22] - 24:9, 25:17, 26:15, 26:19, 33:6, 56:13, 71:10, 73:23, 101:3, 110:21, 116:3, 121:9, 121:10, 146:13, 148:6, 148:21, 149:1, 149:9, 155:13, 160:21, 161:18, 161:21</p> <p><b>analytical</b> [1] - 115:21</p> <p><b>analyzed</b> [2] - 58:5, 65:19</p> <p><b>Andover</b> [2] - 112:12, 112:22</p> <p><b>annotates</b> [1] - 120:7</p> <p><b>annual</b> [2] - 100:11, 123:2</p> <p><b>answer</b> [3] - 86:2, 129:16, 157:7</p> <p><b>answered</b> [4] - 48:9, 85:23, 86:8, 152:1</p> <p><b>answering</b> [1] - 138:16</p> <p><b>answers</b> [2] - 86:5, 86:6</p> <p><b>Anthony</b> [2] - 5:21, 176:5</p> <p><b>ANTHONY</b> [2] - 6:1, 93:8</p> <p><b>anticipate</b> [5] - 7:4, 46:23, 105:12, 146:2</p> <p><b>anyway</b> [1] - 174:23</p> <p><b>apart</b> [2] - 33:7, 52:25</p> <p><b>apologize</b> [1] - 17:17</p> <p><b>apparent</b> [2] - 37:23, 121:3</p> <p><b>appeals</b> [1] - 134:12</p> <p><b>appear</b> [3] - 91:2, 149:11, 154:22</p> <p><b>appearance</b> [1] - 5:6</p> <p><b>appearances</b> [2] - 4:7,</p>
---	---	---	--

<p>5:7  <b>applicable</b> [5] - 28:14, 56:2, 56:8, 90:7, 90:9  <b>applied</b> [6] - 28:15, 42:15, 56:3, 56:12, 121:10, 172:8  <b>applies</b> [3] - 39:12, 61:7, 65:21  <b>apply</b> [4] - 29:4, 39:6, 55:16, 172:18  <b>appreciable</b> [1] - 158:9  <b>appreciate</b> [1] - 6:23  <b>approach</b> [12] - 20:9, 24:16, 26:7, 53:21, 56:6, 56:22, 57:18, 59:1, 60:7, 101:15, 105:6, 123:15  <b>Approach</b> [1] - 88:1  <b>approaches</b> [6] - 55:23, 88:3, 101:18, 101:24, 130:14, 144:13  <b>appropriate</b> [11] - 24:3, 41:3, 55:7, 59:13, 60:2, 82:5, 87:8, 121:12, 122:9, 145:22, 145:23  <b>appropriately</b> [1] - 131:22  <b>approval</b> [1] - 167:23  <b>approve</b> [1] - 167:20  <b>approved</b> [2] - 147:3, 159:25  <b>approximate</b> [2] - 64:17, 66:10  <b>AQ1</b> [3] - 153:10, 153:12, 154:19  <b>Aqueous</b> [1] - 42:14  <b>aquifer</b> [14] - 13:10, 18:10, 20:6, 20:7, 21:6, 51:17, 53:16, 53:24, 53:25, 55:20, 58:19, 86:17, 95:3, 118:1  <b>aquifers</b> [3] - 15:2, 53:17, 111:21  <b>arbitrary</b> [1] - 106:9  <b>ARCHER</b> [1] - 2:7  <b>Archer</b> [1] - 4:24  <b>area</b> [38] - 13:1, 15:4, 21:7, 21:11, 47:12, 47:14, 49:6, 56:24, 61:8, 66:4, 66:7, 68:12, 70:11, 70:24, 71:3, 74:5, 80:16, 81:20, 82:4, 82:9, 82:25, 84:18, 90:19, 103:20, 108:25, 111:11, 111:18,</p>	<p>112:4, 117:13, 124:17, 133:5, 141:4, 141:14, 141:15, 154:1, 154:5, 165:24  <b>areas</b> [15] - 10:9, 10:14, 10:17, 10:22, 11:4, 14:9, 16:17, 18:8, 18:10, 18:13, 18:14, 22:19, 22:20, 80:9, 130:20  <b>argue</b> [1] - 8:16  <b>argued</b> [1] - 108:10  <b>arguments</b> [1] - 175:1  <b>arrive</b> [1] - 26:9  <b>aside</b> [2] - 48:17, 174:12  <b>assess</b> [1] - 148:18  <b>assessment</b> [6] - 111:25, 137:20, 137:25, 153:18, 163:19, 166:14  <b>assignment</b> [1] - 17:4  <b>assist</b> [2] - 109:13, 135:18  <b>assisted</b> [1] - 162:14  <b>associated</b> [15] - 22:4, 84:17, 110:4, 110:9, 110:13, 113:25, 115:13, 116:15, 117:3, 125:13, 155:2, 156:16, 163:24, 165:5, 173:25  <b>assume</b> [3] - 7:6, 13:20, 166:3  <b>assumed</b> [5] - 79:16, 126:17, 149:2, 149:4, 165:3  <b>assuming</b> [2] - 7:9, 134:1  <b>assumption</b> [3] - 137:16, 149:8, 149:10  <b>asterisk</b> [2] - 97:4, 97:6  <b>asymptotic</b> [6] - 158:4, 158:7, 159:20, 160:1, 160:12, 165:7  <b>atoms</b> [3] - 36:13, 36:14  <b>attach</b> [1] - 81:8  <b>attacks</b> [1] - 63:14  <b>attempt</b> [2] - 33:16, 41:2  <b>attempting</b> [1] - 107:13  <b>attempts</b> [1] - 109:4  <b>attenuation</b> [42] - 57:15, 57:17, 57:24, 58:6, 58:8, 58:9, 58:17, 58:21, 59:1, 59:12, 59:17, 59:23, 90:13, 91:18, 92:2, 95:6, 95:9, 101:1, 106:9, 121:20, 122:22, 130:12,</p>	<p>130:16, 130:23, 130:24, 131:1, 131:4, 131:8, 131:11, 131:15, 158:14, 158:17, 158:20, 159:10, 159:21, 159:22, 161:7, 162:4, 168:17, 168:21, 169:8, 169:9  <b>Attorney</b> [1] - 4:16  <b>ATTORNEY</b> [1] - 1:19  <b>attorney</b> [2] - 177:11, 177:13  <b>attorneys</b> [1] - 174:8  <b>attribute</b> [2] - 72:25, 78:10  <b>attributed</b> [2] - 78:11, 164:5  <b>audit</b> [1] - 130:4  <b>August</b> [12] - 107:15, 128:23, 133:14, 134:3, 150:6, 152:11, 153:6, 153:21, 158:1, 160:14, 161:2, 169:2  <b>auspices</b> [1] - 147:20  <b>authorities</b> [1] - 167:24  <b>authority</b> [5] - 138:2, 138:25, 139:2, 143:5, 147:25  <b>authorized</b> [1] - 168:14  <b>available</b> [3] - 33:15, 33:17, 41:10  <b>Avenue</b> [13] - 66:8, 71:1, 82:14, 83:22, 84:13, 85:6, 85:11, 87:16, 87:18, 132:22, 132:25, 133:6, 152:23  <b>avoid</b> [1] - 36:9  <b>aware</b> [9] - 85:19, 104:13, 139:13, 139:17, 139:21, 141:24, 147:7, 154:3, 172:23  <b>AXINE</b> [1] - 1:15</p>	<p>19:10, 19:22, 20:13, 22:4, 22:14, 24:2, 24:9, 26:15, 28:23, 31:7, 31:22, 42:3, 46:23, 59:19, 75:1, 85:23, 86:5, 87:13, 90:11, 98:17, 99:11, 100:11, 101:5, 101:6, 105:22, 120:10, 133:2, 135:4, 144:12, 156:13, 159:16, 161:20, 167:11, 171:9, 171:23  <b>baseline</b> [2] - 162:19, 162:23  <b>basic</b> [2] - 22:10, 64:11  <b>basis</b> [7] - 10:25, 18:17, 24:1, 28:20, 107:16, 123:2, 172:13  <b>Bates</b> [1] - 139:24  <b>BE</b> [1] - 3:8  <b>beach</b> [1] - 14:8  <b>bearing</b> [1] - 15:11  <b>beautiful</b> [1] - 49:4  <b>became</b> [2] - 9:5, 37:23  <b>become</b> [3] - 70:4, 70:5, 102:8  <b>becomes</b> [1] - 61:16  <b>bedrock</b> [42] - 14:13, 14:14, 14:16, 15:2, 51:18, 66:24, 67:2, 67:4, 67:7, 69:2, 69:3, 69:6, 69:8, 69:9, 69:12, 69:16, 69:20, 69:21, 69:23, 73:4, 74:14, 75:14, 75:15, 76:19, 76:22, 84:12, 85:2, 87:15, 94:20, 99:6, 111:17, 111:18, 111:19, 116:7, 119:24, 120:5, 144:22, 144:24, 146:11, 151:16, 153:4, 173:1  <b>began</b> [1] - 161:2  <b>beginning</b> [1] - 59:2  <b>begun</b> [1] - 161:10  <b>behalf</b> [9] - 1:21, 2:8, 2:11, 4:10, 4:15, 4:19, 4:24, 6:1, 150:23  <b>behave</b> [3] - 34:16, 34:19, 38:9  <b>behavior</b> [1] - 124:11  <b>behind</b> [2] - 61:5, 141:21  <b>believes</b> [5] - 137:12, 138:3, 138:20, 142:24, 142:25</p>
<b>B</b>			
		<p><b>background</b> [3] - 8:1, 10:3, 112:1  <b>bacteria</b> [2] - 60:14, 60:24  <b>Bakers</b> [6] - 48:8, 48:13, 106:19, 117:1, 121:7, 122:10  <b>bar</b> [1] - 72:8  <b>base</b> [2] - 29:18, 110:17  <b>based</b> [37] - 17:8, 18:24,</p>	

<p><b>below</b> [16] - 7:23, 29:1, 29:20, 45:16, 50:14, 55:12, 62:9, 67:2, 75:24, 81:16, 94:21, 111:12, 111:17, 112:24, 141:11, 153:15</p> <p><b>beneath</b> [4] - 69:5, 75:15, 118:5, 124:20</p> <p><b>bent</b> [1] - 70:4</p> <p><b>benzene</b> [4] - 37:25, 38:1, 38:3, 77:12</p> <p><b>Berger</b> [1] - 4:18</p> <p><b>BERGER</b> [1] - 1:20</p> <p><b>best</b> [1] - 105:22</p> <p><b>better</b> [2] - 44:8, 60:21</p> <p><b>between</b> [24] - 13:3, 13:11, 18:13, 23:3, 71:22, 80:10, 83:18, 84:16, 86:5, 86:22, 87:7, 87:19, 94:1, 102:6, 102:7, 102:20, 103:8, 105:10, 119:3, 124:8, 126:18, 128:25, 130:6, 160:23</p> <p><b>beyond</b> [3] - 82:14, 125:8, 157:1</p> <p><b>bid</b> [2] - 98:11, 173:16</p> <p><b>bids</b> [1] - 99:12</p> <p><b>bigger</b> [1] - 101:22</p> <p><b>billion</b> [24] - 35:10, 35:15, 39:17, 39:18, 40:3, 40:4, 54:10, 55:12, 59:15, 77:21, 78:4, 78:9, 101:5, 103:25, 112:24, 113:21, 114:4, 116:17, 116:23, 117:6, 120:16, 120:17, 123:8</p> <p><b>binder</b> [1] - 6:20</p> <p><b>biodegradation</b> [9] - 37:20, 38:4, 38:14, 60:5, 60:8, 60:10, 60:11, 61:3, 130:17</p> <p><b>biodegrades</b> [1] - 38:2</p> <p><b>bit</b> [2] - 103:14, 110:11</p> <p><b>bituminous</b> [2] - 81:2, 81:6</p> <p><b>bodies</b> [2] - 46:9, 112:6</p> <p><b>body</b> [5] - 18:12, 27:18, 27:19, 27:22, 49:9</p> <p><b>Bollar</b> [1] - 4:24</p> <p><b>BOLLAR</b> [2] - 2:7, 4:23</p> <p><b>bore</b> [12] - 68:2, 82:17, 83:2, 102:5, 102:23,</p>	<p>103:4, 104:23, 105:12, 105:13, 144:2, 144:14, 146:3</p> <p><b>boring</b> [2] - 68:6, 68:7</p> <p><b>Bottle</b> [1] - 71:20</p> <p><b>bottom</b> [5] - 45:13, 52:2, 68:20, 97:6, 99:20</p> <p><b>bound</b> [1] - 35:21</p> <p><b>branched</b> [1] - 36:7</p> <p><b>brand</b> [1] - 106:2</p> <p><b>branding</b> [1] - 71:4</p> <p><b>break</b> [3] - 92:10, 128:6, 159:1</p> <p><b>breaks</b> [1] - 63:11</p> <p><b>brief</b> [5] - 5:17, 69:24, 72:4, 154:8, 174:25</p> <p><b>briefing</b> [2] - 6:16, 107:25</p> <p><b>briefly</b> [15] - 7:20, 7:25, 11:7, 12:12, 12:22, 17:5, 18:5, 20:25, 24:16, 62:17, 98:25, 102:2, 112:19, 116:9, 117:22</p> <p><b>bringing</b> [1] - 6:18</p> <p><b>broad</b> [1] - 52:7</p> <p><b>broken</b> [1] - 37:21</p> <p><b>Brook</b> [1] - 4:14</p> <p><b>brook</b> [1] - 112:6</p> <p><b>Brown</b> [20] - 5:21, 7:17, 10:14, 11:7, 47:21, 93:14, 139:17, 140:4, 146:6, 148:6, 150:2, 152:10, 154:9, 155:12, 160:7, 166:21, 167:3, 168:13, 169:14, 176:5</p> <p><b>brown</b> [2] - 12:24, 128:17</p> <p><b>BROWN</b> [2] - 6:1, 93:8</p> <p><b>Brown's</b> [1] - 138:9</p> <p><b>bubbling</b> [1] - 118:1</p> <p><b>bullet</b> [1] - 32:1</p> <p><b>bullets</b> [1] - 16:21</p> <p><b>burn</b> [2] - 22:16, 65:9</p> <p><b>business</b> [2] - 9:10, 98:7</p> <p><b>butyl</b> [2] - 28:3, 28:4</p> <p><b>BY</b> [36] - 1:15, 1:17, 1:19, 1:20, 2:6, 2:7, 2:10, 7:16, 10:13, 11:6, 44:1, 48:19, 64:7, 79:21, 93:11, 96:6, 98:21, 100:24, 102:24, 106:6, 106:18, 110:1, 115:3, 123:23, 128:16, 129:24,</p>	<p>138:19, 140:3, 148:5, 150:1, 152:9, 156:6, 157:20, 159:8, 161:12, 168:12</p> <p style="text-align: center;"><b>C</b></p> <p><b>Cal</b> [1] - 8:17</p> <p><b>calculate</b> [3] - 51:6, 51:7, 82:22</p> <p><b>calculated</b> [1] - 171:23</p> <p><b>calculates</b> [1] - 171:17</p> <p><b>calculation</b> [5] - 164:17, 164:25, 171:6, 172:6, 172:8</p> <p><b>calculations</b> [3] - 106:13, 155:23, 171:10</p> <p><b>cannot</b> [5] - 141:5, 142:23, 143:4, 166:3, 168:13</p> <p><b>capillary</b> [2] - 13:13, 61:13</p> <p><b>capital</b> [7] - 88:20, 88:25, 99:23, 100:2, 100:4, 100:6, 100:9</p> <p><b>capture</b> [3] - 49:20, 49:21, 63:24</p> <p><b>captures</b> [1] - 63:2</p> <p><b>capturing</b> [1] - 63:4</p> <p><b>carbon</b> [5] - 35:22, 36:12, 63:12, 81:9, 99:8</p> <p><b>carbons</b> [2] - 36:15, 80:25</p> <p><b>career</b> [3] - 9:14, 11:12, 16:1</p> <p><b>CARLOS</b> [1] - 2:7</p> <p><b>Carlos</b> [1] - 4:24</p> <p><b>case</b> [48] - 10:15, 11:24, 12:5, 14:10, 16:22, 17:5, 20:5, 21:18, 22:1, 23:18, 24:17, 25:5, 26:8, 26:17, 27:24, 28:16, 30:3, 30:7, 30:19, 31:3, 31:6, 40:14, 46:3, 46:21, 46:25, 49:8, 49:16, 49:23, 50:3, 50:15, 51:17, 52:6, 55:5, 55:16, 56:14, 58:20, 63:7, 65:11, 68:1, 80:23, 100:21, 104:13, 116:20, 154:8, 160:9, 165:3, 166:4, 172:21</p> <p><b>cases</b> [13] - 13:23, 26:12, 26:14, 32:20, 32:21, 39:1, 45:20, 56:1,</p>	<p>62:9, 63:4, 123:2, 135:7, 151:3</p> <p><b>casings</b> [6] - 143:8, 145:4, 145:6, 145:18, 146:8, 146:15</p> <p><b>causes</b> [1] - 21:15</p> <p><b>CCR</b> [3] - 1:24, 3:15, 177:20</p> <p><b>CEA</b> [6] - 141:4, 141:7, 141:10, 141:16, 141:21, 167:11</p> <p><b>cemented</b> [1] - 14:6</p> <p><b>centralized</b> [1] - 93:16</p> <p><b>century</b> [1] - 39:2</p> <p><b>Century</b> [1] - 51:5</p> <p><b>certain</b> [21] - 17:9, 22:19, 29:1, 34:18, 35:20, 43:21, 60:20, 84:20, 96:21, 98:15, 101:5, 126:8, 132:13, 136:13, 141:5, 142:3, 143:4, 151:9, 154:4, 166:3, 166:25</p> <p><b>certainly</b> [13] - 7:22, 8:14, 12:23, 15:19, 18:6, 21:1, 49:1, 52:13, 74:9, 74:25, 99:1, 111:9, 174:17</p> <p><b>Certificate</b> [1] - 177:21</p> <p><b>CERTIFIED</b> [1] - 3:8</p> <p><b>Certified</b> [1] - 177:4</p> <p><b>certify</b> [2] - 177:5, 177:10</p> <p><b>cetera</b> [1] - 46:9</p> <p><b>chain</b> [3] - 36:1, 36:7</p> <p><b>chambers</b> [1] - 174:19</p> <p><b>chance</b> [1] - 162:2</p> <p><b>chances</b> [1] - 98:10</p> <p><b>change</b> [10] - 75:8, 75:9, 78:5, 79:6, 97:6, 121:3, 124:11, 127:22, 131:20, 173:17</p> <p><b>changed</b> [5] - 70:7, 109:8, 124:8, 132:11, 173:17</p> <p><b>changes</b> [3] - 74:5, 75:6, 132:7</p> <p><b>changing</b> [1] - 133:22</p> <p><b>characteristic</b> [1] - 37:4</p> <p><b>characteristics</b> [1] - 38:7</p> <p><b>characterize</b> [2] - 76:25, 136:4</p> <p><b>characterized</b> [3] - 76:17, 76:22, 168:15</p>
---	---	--	---

<p><b>characterizing</b> [1] - 69:16</p> <p><b>charge</b> [1] - 173:16</p> <p><b>cheaper</b> [1] - 146:5</p> <p><b>check</b> [1] - 168:11</p> <p><b>chemical</b> [16] - 23:10, 28:10, 29:1, 30:9, 30:12, 34:18, 34:24, 35:18, 37:10, 57:19, 63:6, 63:9, 63:11, 63:14, 110:13</p> <p><b>chemicals</b> [4] - 28:15, 65:15, 81:10, 141:11</p> <p><b>chemistry</b> [5] - 36:9, 65:16, 65:20, 110:19, 113:3</p> <p><b>chlorinated</b> [2] - 37:16, 60:23</p> <p><b>choose</b> [1] - 161:20</p> <p><b>chronology</b> [4] - 72:2, 72:5, 113:9, 114:2</p> <p><b>circumstances</b> [1] - 133:19</p> <p><b>cited</b> [2] - 148:12, 148:23</p> <p><b>city</b> [3] - 51:4, 51:5, 70:16</p> <p><b>City</b> [12] - 70:16, 72:13, 72:24, 76:4, 76:7, 76:14, 83:11, 83:19, 84:1, 84:7, 85:14, 85:18</p> <p><b>CIVIL</b> [1] - 1:2</p> <p><b>civil</b> [1] - 8:8</p> <p><b>claim</b> [7] - 97:7, 97:10, 106:7, 155:14, 169:20, 169:22, 169:24</p> <p><b>claims</b> [1] - 9:23</p> <p><b>clarification</b> [1] - 107:11</p> <p><b>clarify</b> [2] - 97:8, 97:17</p> <p><b>CLARKSON</b> [1] - 1:10</p> <p><b>classification</b> [1] - 141:4</p> <p><b>classified</b> [1] - 69:2</p> <p><b>clay</b> [1] - 111:16</p> <p><b>clays</b> [1] - 14:6</p> <p><b>Clean</b> [2] - 22:17, 22:22</p> <p><b>clean</b> [11] - 11:22, 40:6, 53:3, 53:9, 54:3, 78:23, 81:18, 130:13, 131:18, 133:12, 170:17</p> <p><b>cleaned</b> [3] - 30:21, 54:24, 129:2</p> <p><b>Cleaners</b> [22] - 114:4, 114:7, 114:9, 114:11, 115:4, 116:1, 116:4, 117:2, 118:20, 119:2,</p>	<p>119:5, 119:21, 122:16, 125:7, 125:8, 125:14, 125:24, 126:2, 126:9, 126:14, 126:18, 127:3</p> <p><b>cleaners</b> [4] - 114:11, 114:19, 114:25, 116:22</p> <p><b>cleaning</b> [11] - 37:16, 56:24, 57:1, 57:2, 57:4, 93:14, 115:12, 115:14, 115:16, 129:10</p> <p><b>cleans</b> [2] - 53:19, 131:5</p> <p><b>cleanup</b> [7] - 30:7, 30:23, 31:5, 31:8, 40:5, 59:11, 159:21</p> <p><b>clear</b> [10] - 19:1, 30:13, 131:4, 144:2, 144:15, 147:18, 162:3, 162:17, 162:23, 170:16</p> <p><b>clearly</b> [7] - 53:14, 89:14, 94:21, 116:14, 156:3, 156:22, 166:17</p> <p><b>CLERK</b> [5] - 4:4, 92:12, 93:4, 128:8, 128:12</p> <p><b>client</b> [6] - 137:24, 138:3, 139:10, 142:21, 142:23, 170:18</p> <p><b>clients</b> [4] - 9:22, 9:25, 25:11, 102:17</p> <p><b>Clinton</b> [1] - 12:17</p> <p><b>close</b> [8] - 52:14, 53:1, 78:1, 94:13, 101:17, 112:25, 128:3</p> <p><b>closest</b> [1] - 120:25</p> <p><b>cluster</b> [20] - 74:17, 94:10, 94:12, 94:15, 95:20, 101:12, 101:17, 102:11, 104:20, 104:22, 105:5, 105:10, 136:1, 143:10, 144:24, 150:17, 151:6, 153:12, 163:16</p> <p><b>clusters</b> [8] - 94:9, 94:24, 95:10, 95:18, 95:19, 96:8, 121:19, 122:20</p> <p><b>coal</b> [1] - 81:2</p> <p><b>coarse</b> [1] - 111:14</p> <p><b>Coast</b> [1] - 64:23</p> <p><b>coconut</b> [1] - 81:2</p> <p><b>COHN</b> [1] - 1:16</p> <p><b>Cohn</b> [1] - 4:13</p> <p><b>coincided</b> [1] - 22:20</p> <p><b>collaboration</b> [1] - 8:21</p> <p><b>colleague</b> [1] - 174:1</p> <p><b>collect</b> [4] - 151:16,</p>	<p>154:20, 156:19, 157:4</p> <p><b>collected</b> [8] - 26:22, 67:23, 75:1, 78:8, 124:6, 125:21, 126:18, 134:6</p> <p><b>collecting</b> [1] - 52:1</p> <p><b>collectively</b> [1] - 57:23</p> <p><b>collects</b> [1] - 151:17</p> <p><b>College</b> [3] - 8:4, 8:8, 8:10</p> <p><b>combination</b> [2] - 40:17, 55:20</p> <p><b>combined</b> [2] - 158:20, 159:11</p> <p><b>combining</b> [1] - 62:18</p> <p><b>combustion</b> [1] - 65:4</p> <p><b>coming</b> [3] - 34:9, 98:10, 98:23</p> <p><b>comment</b> [1] - 140:22</p> <p><b>commercial</b> [6] - 66:20, 71:20, 75:18, 75:21, 76:9, 76:11</p> <p><b>commingled</b> [1] - 86:10</p> <p><b>commingling</b> [2] - 86:12, 86:14</p> <p><b>commitment</b> [1] - 166:8</p> <p><b>committed</b> [2] - 164:19, 165:15</p> <p><b>common</b> [5] - 22:12, 22:13, 54:19, 60:7, 113:4</p> <p><b>commonly</b> [2] - 101:24, 115:13</p> <p><b>companies</b> [3] - 11:9, 11:12, 33:2</p> <p><b>company</b> [5] - 9:4, 9:6, 65:1, 67:25, 144:15</p> <p><b>comparable</b> [2] - 8:18, 79:6</p> <p><b>compare</b> [1] - 36:18</p> <p><b>compared</b> [8] - 15:14, 36:19, 52:23, 53:10, 57:3, 109:10, 125:13, 138:13</p> <p><b>compares</b> [1] - 38:17</p> <p><b>comparison</b> [1] - 105:23</p> <p><b>competent</b> [1] - 14:13</p> <p><b>compile</b> [1] - 72:2</p> <p><b>complete</b> [8] - 32:11, 82:16, 101:19, 102:22, 105:1, 113:14, 140:21, 174:8</p> <p><b>completed</b> [14] - 15:1, 32:17, 52:14, 52:18,</p>	<p>67:6, 74:18, 75:14, 75:23, 83:3, 91:12, 93:17, 94:13, 102:11, 163:14</p> <p><b>completely</b> [4] - 13:4, 13:8, 50:16, 115:25</p> <p><b>completes</b> [1] - 137:7</p> <p><b>completing</b> [3] - 41:1, 101:15, 102:4</p> <p><b>completion</b> [5] - 54:13, 101:20, 101:23, 105:2, 155:4</p> <p><b>completions</b> [3] - 94:11, 103:15, 146:4</p> <p><b>complex</b> [8] - 15:17, 15:20, 20:10, 52:22, 54:14, 69:25, 144:5, 146:4</p> <p><b>complexity</b> [2] - 53:8, 73:2</p> <p><b>complicated</b> [6] - 20:12, 44:9, 51:14, 53:25, 101:20, 101:22</p> <p><b>comply</b> [1] - 29:7</p> <p><b>components</b> [1] - 136:15</p> <p><b>compound</b> [8] - 30:14, 30:16, 36:13, 37:7, 37:8, 39:15, 63:16, 158:25</p> <p><b>compounds</b> [2] - 22:15, 36:12</p> <p><b>comprised</b> [1] - 14:5</p> <p><b>compromised</b> [1] - 102:9</p> <p><b>concede</b> [3] - 107:24, 133:16, 145:24</p> <p><b>concentration</b> [20] - 28:24, 29:1, 30:25, 59:20, 77:14, 78:3, 78:21, 96:9, 112:22, 113:1, 113:4, 113:18, 113:20, 114:3, 115:23, 116:22, 120:16, 125:3, 127:8, 131:8</p> <p><b>concentrations</b> [30] - 29:14, 31:24, 35:15, 40:11, 47:10, 59:6, 59:22, 62:21, 63:1, 77:12, 77:15, 78:15, 79:2, 90:20, 92:3, 116:5, 116:13, 117:10, 117:14, 121:2, 123:7, 124:21, 127:1, 127:5, 130:21, 132:23, 133:6, 141:14, 142:13, 162:14</p>
---	---	--	---

<p><b>concept</b> [2] - 103:1, 118:22</p> <p><b>conception</b> [1] - 46:19</p> <p><b>concepts</b> [1] - 119:13</p> <p><b>conceptual</b> [2] - 41:20, 45:24</p> <p><b>conceptually</b> [1] - 41:19</p> <p><b>concern</b> [15] - 27:24, 27:25, 28:11, 37:15, 37:25, 71:19, 77:11, 102:1, 102:4, 102:9, 103:7, 104:2, 104:4, 115:7, 141:11</p> <p><b>concerned</b> [3] - 28:2, 28:19, 144:11</p> <p><b>concerning</b> [5] - 9:21, 73:15, 76:25, 79:23, 128:18</p> <p><b>concerns</b> [2] - 144:9, 144:12</p> <p><b>conclude</b> [1] - 86:11</p> <p><b>concluded</b> [2] - 151:2, 159:18</p> <p><b>conclusion</b> [2] - 26:15, 161:24</p> <p><b>conclusions</b> [3] - 26:10, 26:12, 135:4</p> <p><b>condition</b> [16] - 17:15, 19:25, 20:1, 21:21, 21:22, 21:23, 24:5, 30:8, 31:8, 39:13, 40:19, 57:7, 95:8, 162:11, 162:16, 162:19</p> <p><b>conditionally</b> [2] - 109:20, 109:24</p> <p><b>conditions</b> [48] - 15:22, 18:1, 24:2, 25:14, 25:24, 34:2, 34:3, 38:25, 41:25, 42:1, 42:2, 46:22, 55:25, 56:11, 57:8, 58:1, 60:20, 60:22, 60:25, 63:8, 67:16, 70:10, 70:11, 71:6, 73:25, 75:13, 77:6, 77:7, 85:1, 96:10, 119:18, 122:8, 127:7, 131:25, 133:2, 134:13, 135:5, 158:4, 158:7, 158:22, 159:13, 159:20, 160:1, 160:12, 161:14, 162:24, 168:20, 173:17</p> <p><b>conduct</b> [1] - 82:25</p> <p><b>conducted</b> [6] - 47:14, 80:6, 89:12, 144:17,</p>	<p>168:17, 168:18</p> <p><b>conducting</b> [1] - 117:23</p> <p><b>cone</b> [4] - 21:5, 21:7, 21:10, 50:5</p> <p><b>confidence</b> [1] - 171:15</p> <p><b>confident</b> [2] - 166:9, 173:2</p> <p><b>confined</b> [1] - 20:7</p> <p><b>confirm</b> [3] - 86:23, 131:14, 165:19</p> <p><b>confirmed</b> [3] - 127:9, 127:14, 162:7</p> <p><b>confirming</b> [1] - 131:17</p> <p><b>connection</b> [4] - 133:13, 154:7, 160:8, 163:2</p> <p><b>connects</b> [2] - 15:6, 15:9</p> <p><b>conservative</b> [1] - 101:8</p> <p><b>conservatively</b> [1] - 160:24</p> <p><b>consider</b> [16] - 16:12, 24:6, 25:15, 28:14, 32:19, 33:22, 39:5, 55:6, 55:24, 89:13, 93:24, 110:20, 112:20, 117:17, 122:15, 142:10</p> <p><b>considerable</b> [1] - 9:16</p> <p><b>consideration</b> [1] - 148:3</p> <p><b>considerations</b> [1] - 28:21</p> <p><b>considered</b> [5] - 24:1, 62:6, 107:14, 122:8, 123:20</p> <p><b>considering</b> [1] - 56:21</p> <p><b>consistent</b> [9] - 82:6, 83:6, 91:6, 112:16, 113:2, 154:24, 162:21, 163:15, 165:23</p> <p><b>consistently</b> [1] - 9:18</p> <p><b>consolidated</b> [1] - 94:20</p> <p><b>constant</b> [2] - 37:10, 133:19</p> <p><b>constituent</b> [1] - 23:4</p> <p><b>constituents</b> [16] - 12:10, 35:3, 35:21, 36:3, 36:25, 37:13, 37:22, 37:25, 38:17, 43:4, 44:13, 60:21, 62:14, 65:19, 115:22, 115:24</p> <p><b>construction</b> [2] - 99:15, 144:5</p> <p><b>consultant</b> [5] - 9:2, 12:7, 33:14, 68:1, 150:23</p>	<p><b>consultants</b> [7] - 25:9, 33:1, 67:23, 68:18, 68:24, 69:9, 73:21</p> <p><b>consulted</b> [1] - 9:20</p> <p><b>consulting</b> [4] - 9:7, 16:3, 17:17, 41:24</p> <p><b>consuming</b> [1] - 28:25</p> <p><b>contact</b> [1] - 44:13</p> <p><b>contain</b> [7] - 34:20, 54:25, 80:24, 81:9, 111:14, 111:16, 167:14</p> <p><b>contained</b> [4] - 33:14, 96:13, 121:14, 142:14</p> <p><b>containing</b> [2] - 34:17, 52:20</p> <p><b>contains</b> [6] - 14:16, 36:2, 36:11, 52:17, 52:20, 111:21</p> <p><b>contaminant</b> [21] - 24:23, 29:3, 29:25, 31:19, 34:8, 41:25, 46:20, 59:6, 61:15, 61:20, 61:24, 63:10, 63:12, 71:5, 77:7, 79:1, 80:1, 115:7, 122:3, 130:19, 158:8</p> <p><b>contaminant's</b> [1] - 46:21</p> <p><b>contaminants</b> [5] - 25:22, 27:24, 27:25, 28:1, 77:11</p> <p><b>contaminate</b> [2] - 27:21, 62:3</p> <p><b>contaminated</b> [20] - 12:8, 12:9, 16:9, 16:10, 25:10, 25:20, 25:24, 53:2, 54:16, 73:22, 80:13, 80:19, 80:24, 81:12, 81:18, 82:1, 84:10, 93:15, 103:17, 131:5</p> <p><b>contamination</b> [100] - 9:19, 9:24, 10:1, 11:10, 11:16, 15:18, 17:13, 23:13, 23:14, 26:2, 26:3, 27:16, 27:20, 31:17, 31:23, 40:15, 42:2, 42:4, 46:3, 46:24, 47:8, 47:12, 48:21, 49:15, 53:19, 53:23, 54:13, 56:18, 56:21, 57:19, 57:23, 58:18, 59:7, 61:11, 61:18, 61:25, 62:24,</p>	<p>63:24, 63:25, 67:3, 72:21, 72:22, 73:5, 77:1, 77:3, 78:16, 78:18, 78:21, 80:23, 81:1, 82:21, 84:7, 84:12, 85:8, 85:10, 85:18, 86:12, 87:4, 87:15, 87:17, 87:19, 88:11, 90:6, 90:10, 90:18, 91:17, 92:3, 95:3, 101:4, 102:6, 103:1, 103:8, 103:21, 104:25, 105:6, 110:9, 118:2, 118:4, 118:19, 119:10, 120:13, 122:18, 124:20, 125:1, 125:3, 127:23, 130:15, 130:18, 133:17, 133:24, 136:5, 136:12, 140:21, 140:25, 141:1, 141:19, 142:15, 145:9, 168:14</p> <p><b>contamination's</b> [1] - 57:21</p> <p><b>contaminations</b> [1] - 59:8</p> <p><b>contend</b> [1] - 108:18</p> <p><b>context</b> [6] - 27:6, 27:8, 109:2, 109:13, 109:17, 146:17</p> <p><b>contiguous</b> [1] - 87:17</p> <p><b>contingency</b> [20] - 97:18, 97:20, 97:22, 97:25, 98:1, 98:13, 98:15, 98:17, 100:19, 170:21, 171:2, 171:9, 171:10, 172:8, 172:17, 172:21, 173:7, 173:20, 173:23, 173:25</p> <p><b>continue</b> [11] - 93:6, 109:25, 118:20, 123:5, 124:16, 125:5, 158:3, 164:14, 167:16, 169:12, 172:16</p> <p><b>continued</b> [9] - 1:21, 5:22, 73:12, 78:25, 79:1, 93:10, 124:14, 129:2, 133:12</p> <p><b>Continued</b> [1] - 92:14</p> <p><b>continues</b> [3] - 21:9, 62:3, 168:25</p> <p><b>continuing</b> [4] - 36:11, 117:15, 165:10, 165:16</p> <p><b>continuous</b> [1] - 44:16</p> <p><b>contour</b> [1] - 50:12</p>
--	---	--	---

<p><b>contouring</b> [1] - 50:13  <b>contractor</b> [1] - 98:9  <b>contractors</b> [1] - 99:13  <b>contrast</b> [1] - 118:12  <b>contribute</b> [1] - 73:10  <b>contributed</b> [1] - 71:7  <b>contribution</b> [1] - 125:16  <b>control</b> [1] - 157:2  <b>controlled</b> [1] - 37:9  <b>controlling</b> [1] - 92:2  <b>convenient</b> [1] - 7:8  <b>copy</b> [4] - 6:13, 149:15, 149:17, 160:7  <b>corner</b> [1] - 107:7  <b>CORPORATION</b> [1] - 1:7  <b>Corporation</b> [3] - 2:8, 2:8, 11:14  <b>correct</b> [144] - 5:14, 5:15, 10:7, 10:23, 11:2, 12:16, 13:18, 14:24, 14:25, 16:14, 16:23, 16:24, 21:14, 21:17, 24:18, 24:19, 27:25, 28:13, 29:6, 30:22, 36:1, 39:21, 40:13, 40:22, 41:3, 46:11, 47:16, 47:17, 48:3, 48:14, 48:15, 49:16, 49:25, 54:7, 55:14, 56:6, 56:7, 61:5, 64:14, 65:9, 65:13, 68:23, 74:6, 74:7, 76:6, 78:6, 84:2, 87:3, 87:9, 87:10, 88:2, 90:15, 90:17, 91:21, 94:7, 94:16, 94:19, 96:10, 96:21, 97:3, 97:15, 98:16, 107:1, 107:2, 110:25, 111:4, 112:9, 112:10, 113:11, 114:1, 114:6, 114:13, 115:6, 118:13, 119:15, 120:2, 120:12, 121:21, 121:22, 121:25, 122:21, 123:9, 123:14, 123:25, 124:2, 124:5, 124:6, 125:12, 126:5, 126:6, 128:20, 128:21, 128:24, 129:10, 129:17, 130:10, 131:16, 132:1, 132:10, 132:21, 133:3, 133:4, 133:11, 134:19, 135:22, 136:1, 136:17, 138:1, 139:7, 140:19, 143:9, 143:10,</p>	<p>143:13, 143:18, 144:3, 144:4, 144:19, 145:2, 146:12, 148:8, 149:9, 150:7, 150:11, 152:17, 153:3, 153:9, 153:11, 153:19, 153:24, 155:23, 158:6, 158:11, 158:24, 159:23, 160:4, 160:17, 162:20, 163:13, 163:23, 165:9, 167:7, 170:13, 170:18, 170:24  <b>Correct</b> [87] - 17:2, 30:21, 31:12, 34:25, 35:19, 46:10, 49:15, 49:24, 51:14, 55:13, 61:4, 64:13, 68:22, 89:1, 90:14, 110:5, 110:24, 111:3, 111:24, 114:5, 115:5, 123:8, 124:17, 127:8, 129:3, 130:1, 130:9, 130:13, 130:18, 130:25, 131:12, 131:19, 132:9, 132:15, 132:20, 133:10, 133:14, 133:20, 134:12, 135:21, 135:25, 136:5, 136:9, 136:12, 136:23, 137:3, 137:9, 137:15, 137:21, 138:23, 139:12, 140:16, 141:1, 141:4, 141:12, 141:20, 143:3, 143:17, 144:18, 144:22, 145:19, 145:22, 146:8, 148:22, 150:10, 150:15, 150:21, 152:11, 152:16, 153:2, 153:8, 153:18, 153:23, 155:2, 155:10, 158:17, 160:2, 160:20, 161:19, 162:11, 163:3, 163:22, 166:24, 167:16, 169:18, 169:23, 170:12  <b>correctly</b> [2] - 108:11, 125:18  <b>cost</b> [45] - 24:11, 57:9, 88:22, 88:25, 89:8, 89:13, 89:15, 89:17, 98:4, 98:5, 98:7, 99:23, 99:24, 100:12, 105:9, 105:16, 105:19, 105:23, 105:24, 106:13, 123:10, 127:22, 138:12, 146:6, 153:17, 155:6, 155:12, 156:15, 161:18, 163:11,</p>	<p>163:19, 163:24, 164:25, 165:5, 166:6, 166:14, 171:1, 171:15, 172:21, 172:25, 173:10, 173:12, 173:22  <b>costed</b> [1] - 146:10  <b>costs</b> [26] - 88:19, 89:5, 89:18, 98:12, 98:19, 98:23, 99:11, 99:13, 99:15, 101:10, 123:12, 133:9, 153:16, 155:1, 156:3, 156:23, 164:8, 165:1, 165:3, 165:8, 165:12, 165:13, 166:5, 166:23, 173:3  <b>counsel</b> [8] - 4:7, 7:6, 97:9, 119:6, 126:21, 175:13, 177:11, 177:13  <b>country</b> [1] - 22:19  <b>county</b> [2] - 9:25, 26:4  <b>couple</b> [1] - 120:24  <b>course</b> [9] - 11:12, 50:1, 105:22, 137:19, 137:24, 151:20, 156:7, 166:11, 173:8  <b>court</b> [5] - 4:3, 93:3, 112:3, 128:11, 175:16  <b>Court</b> [4] - 6:13, 109:13, 177:4  <b>COURT</b> [102] - 1:1, 1:25, 3:15, 4:5, 4:12, 5:4, 5:16, 5:18, 5:20, 6:5, 6:10, 6:14, 6:22, 7:9, 7:13, 10:2, 10:8, 10:21, 11:1, 11:3, 42:5, 43:19, 45:6, 47:20, 48:1, 48:4, 48:17, 64:5, 79:13, 79:18, 88:23, 91:7, 91:19, 91:23, 92:7, 93:5, 95:14, 95:19, 95:25, 97:13, 97:16, 97:21, 98:1, 98:14, 98:20, 99:18, 99:24, 100:3, 100:7, 100:13, 100:17, 100:23, 102:13, 102:19, 104:2, 105:9, 105:15, 105:21, 106:2, 106:5, 106:17, 107:21, 108:20, 109:3, 109:16, 109:21, 109:25, 114:15, 114:18, 114:23, 123:22, 128:3, 128:7, 128:13, 129:14, 138:11, 146:16, 146:21,</p>	<p>147:1, 147:6, 147:8, 147:13, 147:23, 148:9, 149:20, 149:24, 152:20, 152:24, 155:20, 157:8, 157:15, 159:1, 159:4, 161:1, 161:4, 161:9, 168:4, 174:3, 174:6, 174:22, 175:2, 175:13  <b>Court's</b> [1] - 106:15  <b>courtesy</b> [1] - 6:13  <b>COURTHOUSE</b> [1] - 1:10  <b>courtroom</b> [1] - 86:22  <b>cover</b> [3] - 12:12, 32:6, 174:11  <b>covers</b> [1] - 163:19  <b>cracks</b> [1] - 14:17  <b>create</b> [3] - 42:1, 62:11, 116:17  <b>created</b> [1] - 135:10  <b>creates</b> [3] - 21:4, 21:7, 21:12  <b>criteria</b> [2] - 24:10, 88:9  <b>critical</b> [2] - 17:10, 32:12  <b>Cross</b> [1] - 176:3  <b>cross</b> [14] - 67:14, 67:15, 67:17, 67:22, 68:8, 68:14, 70:14, 102:6, 103:7, 104:25, 108:16, 109:18, 114:24, 120:7  <b>CROSS</b> [1] - 128:15  <b>cross-examination</b> [2] - 108:16, 114:24  <b>CROSS-EXAMINATION</b> [1] - 128:15  <b>cross-examines</b> [1] - 109:18  <b>cross-section</b> [5] - 67:17, 68:8, 68:14, 70:14, 120:7  <b>cross-sections</b> [3] - 67:14, 67:15, 67:22  <b>crossed</b> [1] - 97:13  <b>crude</b> [1] - 36:11  <b>Cumberland</b> [4] - 2:11, 5:2, 5:11, 48:7  <b>curious</b> [1] - 106:11  <b>current</b> [10] - 9:18, 41:14, 42:1, 91:14, 96:19, 97:10, 135:5, 151:4, 155:5, 172:17  <b>customers</b> [1] - 29:14  <b>cut</b> [4] - 44:16, 135:8, 135:14, 166:13</p>
--	--	--	--

<b>cut-off</b> [2] - 135:8, 135:14 <b>cuts</b> [1] - 78:20	<b>decade</b> [1] - 170:12 <b>decades</b> [3] - 38:23, 39:1, 44:25 <b>December</b> [1] - 78:6 <b>decide</b> [3] - 134:17, 151:8, 156:9 <b>decided</b> [2] - 150:20, 156:5 <b>decides</b> [3] - 136:22, 137:2, 166:11 <b>deciding</b> [1] - 109:14 <b>decision</b> [1] - 165:23 <b>deck</b> [1] - 108:5 <b>declaration</b> [4] - 154:7, 154:9, 154:16, 160:8 <b>decline</b> [1] - 78:10 <b>declining</b> [3] - 124:22, 130:21, 131:8 <b>deducted</b> [3] - 97:14, 97:18, 97:19 <b>deep</b> [8] - 36:8, 45:11, 45:19, 73:25, 76:21, 83:2, 86:17, 116:20 <b>deeper</b> [6] - 21:10, 38:18, 85:2, 103:17, 116:6, 116:14 <b>defendant's</b> [1] - 106:12 <b>Defendant's</b> [5] - 139:23, 140:1, 149:16, 149:18, 152:7 <b>Defendants</b> [3] - 1:8, 2:8, 2:11 <b>defendants</b> [2] - 25:4, 106:7 <b>defense</b> [1] - 26:9 <b>deficiencies</b> [1] - 32:8 <b>defined</b> [5] - 63:24, 69:13, 73:5, 74:14, 172:14 <b>definitively</b> [1] - 160:3 <b>degradation</b> [9] - 28:8, 30:5, 49:19, 60:13, 60:15, 101:6, 130:22, 160:22, 161:22 <b>degrade</b> [2] - 57:22, 60:24 <b>degrading</b> [1] - 60:18 <b>degree</b> [6] - 8:3, 13:19, 30:6, 75:7, 98:4, 171:14 <b>Degree</b> [1] - 8:9 <b>degrees</b> [3] - 16:7, 16:9, 76:2 <b>delineate</b> [6] - 136:4,	137:13, 138:5, 138:21, 151:22, 156:10 <b>delineated</b> [5] - 136:23, 137:3, 139:6, 142:25, 168:15 <b>delineating</b> [3] - 136:11, 136:16, 136:19 <b>delineation</b> [4] - 112:3, 135:19, 140:19, 140:22 <b>deliver</b> [1] - 29:13 <b>demand</b> [1] - 139:2 <b>demonstrably</b> [1] - 105:16 <b>demonstrate</b> [5] - 92:2, 95:5, 158:24, 159:15, 161:15 <b>density</b> [1] - 15:21 <b>DEP</b> [18] - 130:1, 130:4, 136:8, 137:25, 138:3, 138:8, 138:20, 139:11, 140:15, 142:24, 147:3, 147:5, 147:21, 167:7, 167:19, 167:24, 173:19 <b>DEP,your</b> [1] - 147:12 <b>DEPARTMENT</b> [2] - 1:4, 1:18 <b>Department</b> [1] - 129:8 <b>depict</b> [2] - 67:13, 67:15 <b>depicted</b> [6] - 14:8, 44:7, 49:10, 66:16, 66:18, 68:17 <b>depiction</b> [2] - 49:2, 49:16 <b>depicts</b> [1] - 14:1 <b>depleted</b> [1] - 21:8 <b>deposit</b> [2] - 14:10, 66:23 <b>deposited</b> [1] - 70:2 <b>deposition</b> [4] - 159:3, 159:5, 159:10, 162:22 <b>depositions</b> [1] - 135:11 <b>deposits</b> [3] - 15:14, 111:12, 111:14 <b>depression</b> [4] - 21:5, 21:12, 21:15, 50:5 <b>depth</b> [13] - 45:21, 52:19, 69:5, 82:16, 84:21, 84:23, 87:8, 94:18, 144:6, 151:9, 151:11, 153:14, 154:20 <b>depths</b> [12] - 74:11, 74:19, 83:3, 143:16, 150:21, 150:24, 151:1, 151:5, 151:22, 152:13,	153:2, 153:13 <b>Deputy</b> [1] - 4:16 <b>DEPUTY</b> [6] - 1:19, 4:4, 92:12, 93:4, 128:8, 128:12 <b>descending</b> [1] - 69:5 <b>describe</b> [8] - 7:25, 40:23, 62:7, 68:6, 98:25, 117:22, 119:19, 125:16 <b>described</b> [9] - 23:1, 47:12, 80:9, 81:21, 83:1, 86:21, 94:10, 121:8, 123:13 <b>describes</b> [3] - 24:16, 24:19, 97:11 <b>description</b> [3] - 64:11, 129:12, 140:25 <b>design</b> [3] - 89:4, 97:5, 135:23 <b>designed</b> [5] - 54:3, 63:22, 118:9, 154:19, 169:16 <b>desire</b> [1] - 103:2 <b>detail</b> [1] - 41:17 <b>detailed</b> [5] - 31:10, 140:24, 148:21, 149:1, 149:9 <b>details</b> [1] - 64:11 <b>detect</b> [8] - 30:11, 30:16, 39:14, 81:16, 112:18, 112:25, 170:8 <b>detected</b> [24] - 55:13, 68:16, 70:18, 70:20, 70:21, 71:8, 72:18, 77:12, 77:15, 77:19, 78:7, 80:1, 85:3, 85:14, 87:5, 90:20, 112:23, 113:21, 116:5, 116:12, 120:20, 132:24, 169:17, 170:2 <b>detection</b> [5] - 30:15, 112:13, 113:2, 120:15, 120:22 <b>detections</b> [9] - 72:24, 85:4, 85:5, 112:8, 112:12, 112:14, 112:15, 112:16, 124:5 <b>determine</b> [11] - 18:19, 19:9, 19:14, 20:10, 24:12, 47:2, 71:7, 84:15, 98:14, 146:13, 148:6 <b>determined</b> [2] - 147:2, 160:22
--	--	--	---

<p><b>determining</b> [4] - 48:10, 55:7, 74:21, 139:5</p> <p><b>develop</b> [5] - 14:22, 17:24, 32:16, 69:11, 85:22</p> <p><b>developed</b> [7] - 51:2, 51:5, 85:25, 99:1, 104:10, 156:23</p> <p><b>developing</b> [4] - 39:19, 101:9, 113:14, 123:12</p> <p><b>developments</b> [1] - 9:12</p> <p><b>develops</b> [1] - 98:4</p> <p><b>diagram</b> [1] - 52:10</p> <p><b>diameter</b> [1] - 144:4</p> <p><b>difference</b> [1] - 105:9</p> <p><b>differences</b> [1] - 69:10</p> <p><b>different</b> [28] - 20:16, 23:24, 26:15, 56:9, 56:25, 57:4, 57:7, 58:9, 69:3, 69:4, 69:8, 74:12, 74:18, 76:21, 86:9, 94:13, 99:5, 102:22, 108:17, 120:8, 120:20, 151:1, 151:3, 151:5, 151:7, 151:11, 153:2</p> <p><b>differential</b> [1] - 105:24</p> <p><b>differentiation</b> [1] - 102:20</p> <p><b>differently</b> [2] - 34:19, 165:13</p> <p><b>difficult</b> [6] - 16:16, 53:8, 53:15, 54:1, 68:11, 152:21</p> <p><b>dig</b> [1] - 6:17</p> <p><b>Dijon</b> [1] - 51:5</p> <p><b>diluted</b> [1] - 130:20</p> <p><b>dilution</b> [1] - 130:17</p> <p><b>dimensions</b> [1] - 140:25</p> <p><b>dioxide</b> [1] - 63:12</p> <p><b>dip</b> [5] - 69:20, 69:23, 70:6, 70:12, 76:20</p> <p><b>diploma</b> [1] - 8:7</p> <p><b>dipping</b> [2] - 111:18, 111:19</p> <p><b>Direct</b> [1] - 176:3</p> <p><b>DIRECT</b> [2] - 7:15, 93:10</p> <p><b>direct</b> [8] - 20:19, 129:21, 130:11, 137:17, 138:5, 138:22, 144:7, 159:2</p> <p><b>DIRECT-EXAMINATION</b> [1] - 93:10</p> <p><b>directed</b> [4] - 137:8, 137:10, 137:20, 139:11</p>	<p><b>direction</b> [28] - 16:5, 16:6, 17:19, 18:20, 19:12, 19:14, 20:10, 20:13, 47:3, 49:7, 74:2, 74:4, 74:21, 75:4, 75:16, 75:17, 75:25, 76:2, 76:6, 83:14, 84:22, 85:1, 85:9, 117:16, 120:2, 120:9, 129:3, 139:13</p> <p><b>directions</b> [2] - 74:23, 119:19</p> <p><b>directly</b> [6] - 28:6, 66:5, 78:17, 116:11, 118:5, 136:17</p> <p><b>disagree</b> [3] - 137:25, 151:10, 151:12</p> <p><b>disagrees</b> [2] - 137:19, 156:8</p> <p><b>disappear</b> [1] - 44:16</p> <p><b>discharge</b> [26] - 17:15, 18:10, 18:14, 21:21, 21:22, 21:23, 24:4, 30:4, 30:8, 31:8, 39:12, 40:18, 50:3, 50:4, 50:7, 95:7, 131:25, 141:23, 158:22, 159:13, 161:14, 162:11, 162:15, 162:24</p> <p><b>disclosed</b> [1] - 115:18</p> <p><b>discount</b> [1] - 173:15</p> <p><b>discovered</b> [1] - 48:11</p> <p><b>discovery</b> [1] - 72:15</p> <p><b>discreet</b> [1] - 82:16</p> <p><b>discrete</b> [4] - 87:15, 94:18, 136:1, 154:20</p> <p><b>discuss</b> [7] - 12:4, 13:23, 16:25, 23:21, 73:19, 114:8, 140:20</p> <p><b>discussed</b> [13] - 36:20, 38:7, 38:10, 39:24, 41:19, 46:8, 48:2, 71:11, 117:25, 163:6, 163:8, 165:20, 171:2</p> <p><b>discusses</b> [2] - 110:2, 111:6</p> <p><b>discussing</b> [4] - 47:23, 48:16, 53:11, 139:8</p> <p><b>discussion</b> [11] - 5:17, 13:20, 26:7, 64:6, 70:1, 101:11, 142:4, 148:1, 174:17, 175:15</p> <p><b>dissolve</b> [5] - 34:24, 35:3, 38:10, 43:5, 44:23</p> <p><b>dissolved</b> [6] - 37:7,</p>	<p>37:17, 62:13, 62:21, 118:5, 118:9</p> <p><b>dissolves</b> [1] - 35:7</p> <p><b>dissolving</b> [1] - 44:14</p> <p><b>distance</b> [8] - 71:22, 78:19, 83:11, 83:17, 83:23, 84:4, 84:16, 87:9</p> <p><b>distant</b> [5] - 80:5, 82:14, 103:23, 104:6, 118:19</p> <p><b>distribution</b> [6] - 52:22, 52:23, 53:14, 54:12, 85:8, 95:2</p> <p><b>DISTRICT</b> [2] - 1:1, 1:1</p> <p><b>dives</b> [1] - 116:20</p> <p><b>division</b> [1] - 164:8</p> <p><b>document</b> [5] - 99:14, 139:24, 140:4, 171:25, 172:2</p> <p><b>documentation</b> [4] - 5:6, 72:4, 111:2, 165:15</p> <p><b>documented</b> [2] - 77:18, 98:18</p> <p><b>documents</b> [6] - 41:3, 41:5, 65:23, 66:1, 109:12, 111:3</p> <p><b>domestic</b> [2] - 27:14, 34:6</p> <p><b>done</b> [37] - 5:10, 25:17, 33:2, 41:8, 49:21, 59:19, 69:15, 79:7, 86:21, 91:11, 92:9, 93:21, 93:25, 95:11, 97:12, 99:3, 118:18, 121:24, 123:2, 124:19, 133:12, 137:14, 137:21, 138:1, 138:13, 139:15, 147:19, 155:22, 156:4, 156:8, 156:15, 161:25, 165:4, 166:10, 166:20, 172:14, 174:10</p> <p><b>dosages</b> [1] - 63:9</p> <p><b>dots</b> [5] - 66:3, 66:4, 66:7, 66:10, 66:11</p> <p><b>doubt</b> [1] - 147:24</p> <p><b>down</b> [19] - 19:12, 20:18, 20:19, 20:20, 37:21, 38:19, 40:15, 53:12, 55:11, 63:12, 67:8, 116:11, 123:7, 139:23, 141:19, 158:15, 160:14, 170:3, 175:9</p> <p><b>down-gradient</b> [3] - 19:12, 116:11, 141:19</p>	<p><b>downhill</b> [2] - 19:16, 20:3</p> <p><b>downsized</b> [1] - 96:19</p> <p><b>draw</b> [5] - 15:4, 15:6, 19:22, 20:23, 101:19</p> <p><b>drawing</b> [2] - 21:11, 67:7</p> <p><b>drill</b> [13] - 54:2, 67:24, 68:2, 68:3, 143:12, 143:17, 144:2, 144:4, 148:14, 149:3, 149:5, 163:16, 172:24</p> <p><b>drilled</b> [9] - 26:21, 68:17, 84:14, 84:18, 87:8, 102:17, 105:4, 120:21, 173:9</p> <p><b>driller</b> [1] - 173:14</p> <p><b>drillers</b> [1] - 173:14</p> <p><b>drilling</b> [7] - 67:16, 67:24, 104:23, 146:3, 148:8, 149:5, 173:2</p> <p><b>drink</b> [1] - 29:6</p> <p><b>drinking</b> [8] - 29:4, 29:7, 39:22, 49:12, 56:20, 57:5, 66:15, 67:5</p> <p><b>drive</b> [4] - 18:14, 18:18, 20:18, 36:8</p> <p><b>drop</b> [2] - 155:2, 170:22</p> <p><b>drop-off</b> [1] - 170:22</p> <p><b>dry</b> [9] - 37:16, 114:11, 114:19, 114:25, 115:11, 115:13, 115:15, 115:16, 116:22</p> <p><b>DUANE</b> [1] - 1:15</p> <p><b>Duane</b> [1] - 4:10</p> <p><b>due</b> [2] - 140:9, 140:10</p> <p><b>duly</b> [1] - 6:2</p> <p><b>duplicate</b> [2] - 164:21, 166:18</p> <p><b>duplicative</b> [2] - 106:9, 166:24</p> <p><b>during</b> [10] - 11:12, 23:5, 116:4, 120:18, 122:23, 124:22, 128:25, 130:6, 130:11, 144:7</p> <p><b>dynamic</b> [1] - 133:16</p>
<b>E</b>			
<p><b>early</b> [3] - 9:17, 37:24, 38:1</p> <p><b>early-to-mid</b> [1] - 37:24</p> <p><b>earth</b> [1] - 7:24</p> <p><b>easier</b> [1] - 149:15</p> <p><b>East</b> [2] - 64:23, 70:25</p> <p><b>east</b> [3] - 68:14, 87:18,</p>			

<p>132:24  <b>EAST</b> [1] - 1:11  <b>educational</b> [1] - 8:1  <b>effect</b> [1] - 21:12  <b>effective</b> [5] - 61:18, 88:11, 89:14, 90:13, 158:13  <b>effectively</b> [1] - 131:21  <b>effectiveness</b> [7] - 24:10, 24:11, 88:10, 89:12, 89:19, 90:4, 90:5  <b>efficiently</b> [2] - 22:17, 65:10  <b>eight</b> [7] - 23:24, 57:13, 88:8, 112:1, 123:24, 124:1, 125:24  <b>either</b> [21] - 6:24, 13:5, 22:12, 27:15, 28:6, 29:8, 29:11, 36:6, 43:4, 81:1, 96:3, 99:11, 102:1, 108:17, 110:6, 130:19, 132:16, 147:10, 149:2, 168:1, 168:10  <b>elected</b> [6] - 137:22, 155:25, 156:11, 156:12, 161:20, 166:16  <b>elects</b> [1] - 173:21  <b>element</b> [2] - 32:1, 88:18  <b>elements</b> [3] - 19:24, 31:13, 113:16  <b>elevation</b> [5] - 19:11, 20:1, 20:2, 20:7, 21:3  <b>elevations</b> [1] - 20:13  <b>eliminate</b> [1] - 93:22  <b>eliminated</b> [1] - 104:25  <b>elsewhere</b> [1] - 104:14  <b>employed</b> [1] - 12:4  <b>employee</b> [2] - 177:11, 177:13  <b>employees</b> [1] - 9:11  <b>enables</b> [1] - 50:25  <b>encounter</b> [2] - 68:5, 76:4  <b>end</b> [6] - 31:2, 59:3, 59:4, 77:17, 147:14, 168:23  <b>engineer</b> [2] - 51:4  <b>engineering</b> [4] - 8:8, 8:9, 8:15, 8:24  <b>English</b> [1] - 8:12  <b>enhance</b> [4] - 22:16, 60:8, 60:9, 63:8  <b>enhanced</b> [1] - 60:5  <b>enhancement</b> [1] - 65:4</p>	<p><b>enhances</b> [1] - 61:3  <b>ensure</b> [2] - 29:13, 166:19  <b>entails</b> [1] - 7:21  <b>entered</b> [2] - 53:9, 69:2  <b>entering</b> [1] - 52:2  <b>enters</b> [3] - 14:19, 15:25, 35:18  <b>entertain</b> [1] - 174:25  <b>entire</b> [3] - 15:4, 77:15, 139:4  <b>ENTITLED</b> [1] - 3:10  <b>environment</b> [13] - 9:10, 34:16, 34:21, 44:10, 53:2, 53:10, 53:11, 60:24, 61:2, 62:12, 66:24, 88:12  <b>ENVIRONMENTAL</b> [2] - 1:5, 1:18  <b>environmental</b> [1] - 8:24  <b>Environmental</b> [1] - 129:9  <b>environments</b> [3] - 15:25, 60:14, 60:16  <b>EPA</b> [1] - 171:23  <b>EPA's</b> [1] - 171:9  <b>equation</b> [1] - 51:2  <b>especially</b> [1] - 122:14  <b>ESQUIRE</b> [6] - 1:15, 1:17, 1:20, 2:6, 2:7, 2:10  <b>essence</b> [2] - 87:6, 108:15  <b>essential</b> [1] - 35:21  <b>essentially</b> [62] - 5:9, 15:4, 17:24, 18:7, 18:18, 18:22, 19:17, 21:3, 21:6, 22:10, 24:8, 24:11, 24:19, 25:8, 28:7, 28:22, 29:19, 30:4, 31:1, 31:5, 32:4, 34:10, 36:22, 39:10, 41:25, 42:16, 43:3, 44:4, 46:2, 49:5, 50:13, 59:4, 61:17, 61:25, 62:18, 63:15, 63:25, 81:15, 86:2, 95:1, 99:2, 101:21, 102:7, 105:21, 107:18, 108:12, 111:11, 111:18, 116:10, 117:10, 117:25, 126:9, 127:7, 127:9, 129:25, 130:2, 130:20, 135:7, 139:9, 158:1, 161:3, 161:4</p>	<p><b>establishes</b> [1] - 28:23  <b>estimate</b> [7] - 93:23, 99:16, 123:10, 127:22, 163:11, 166:6, 172:24  <b>estimated</b> [1] - 99:13  <b>estimates</b> [5] - 98:8, 138:13, 155:6, 171:1, 171:10  <b>estimating</b> [1] - 57:9  <b>et</b> [3] - 1:5, 1:7, 46:9  <b>ethanol</b> [1] - 22:14  <b>ether</b> [4] - 22:12, 28:3, 115:20, 115:23  <b>evaluate</b> [22] - 16:22, 18:22, 21:19, 23:16, 24:9, 25:23, 27:23, 40:16, 42:12, 45:25, 46:25, 53:18, 55:18, 57:25, 58:5, 65:20, 70:23, 71:9, 73:24, 89:17, 135:19, 155:5  <b>evaluated</b> [15] - 17:13, 23:24, 25:16, 47:7, 57:14, 60:4, 71:5, 77:5, 84:25, 86:4, 88:8, 104:18, 111:24, 151:12, 171:9  <b>evaluating</b> [15] - 12:1, 12:8, 19:19, 21:18, 25:9, 25:14, 28:16, 40:24, 41:24, 46:2, 46:19, 55:22, 69:9, 70:23, 73:22  <b>evaluation</b> [9] - 17:20, 20:6, 23:23, 32:12, 41:1, 50:11, 80:11, 88:8, 89:11  <b>evaporate</b> [1] - 89:17  <b>event</b> [1] - 169:17  <b>events</b> [1] - 33:11  <b>eventually</b> [9] - 9:5, 13:6, 40:17, 44:15, 44:21, 44:22, 49:8, 63:11, 115:2  <b>evidence</b> [2] - 28:16, 109:5  <b>Evidence</b> [1] - 176:10  <b>evident</b> [2] - 16:18, 42:10  <b>exact</b> [8] - 95:23, 105:11, 121:9, 131:12, 146:1, 146:25, 154:1, 164:7  <b>exactly</b> [3] - 11:1, 59:23, 167:1</p>	<p><b>EXAMINATION</b> [3] - 7:15, 93:10, 128:15  <b>examination</b> [5] - 108:16, 114:24, 144:7, 174:15  <b>examines</b> [1] - 109:18  <b>example</b> [25] - 16:1, 18:7, 20:17, 26:3, 29:4, 34:4, 34:7, 44:18, 53:17, 60:6, 60:22, 68:19, 75:8, 75:17, 86:8, 89:21, 112:21, 132:18, 134:11, 134:16, 142:11, 143:14, 152:18, 155:24, 166:16  <b>examples</b> [1] - 65:1  <b>except</b> [1] - 89:8  <b>exception</b> [1] - 141:4  <b>excerpts</b> [2] - 6:15, 6:18  <b>exchange</b> [1] - 8:19  <b>exclude</b> [1] - 106:12  <b>excluded</b> [1] - 165:8  <b>excused</b> [2] - 175:9, 175:12  <b>Exhibit</b> [10] - 64:9, 106:21, 139:24, 140:1, 140:4, 149:16, 149:18, 152:3, 152:7, 153:5  <b>exhibit</b> [1] - 7:1  <b>Exhibits</b> [3] - 6:8, 6:11, 176:10  <b>exist</b> [2] - 61:2, 150:15  <b>existing</b> [17] - 26:19, 31:22, 32:8, 81:23, 85:8, 105:3, 145:13, 148:14, 149:5, 150:17, 151:5, 163:21, 164:1, 164:2, 164:11, 164:15, 164:23  <b>expanded</b> [5] - 80:12, 80:15, 90:25, 118:15, 132:19  <b>expect</b> [6] - 104:7, 113:5, 114:12, 117:6, 118:19, 134:8  <b>expectation</b> [1] - 133:15  <b>expected</b> [7] - 16:10, 44:15, 117:13, 119:4, 124:15, 132:3, 133:7  <b>expecting</b> [1] - 107:12  <b>expensive</b> [4] - 89:10, 105:14, 145:25, 146:7  <b>experience</b> [7] - 11:8, 22:5, 144:13, 144:20, 144:23, 145:15, 173:14</p>
---	--	--	---

<p><b>expert</b> [23] - 10:15, 10:16, 10:19, 11:4, 12:7, 26:24, 66:6, 68:12, 71:15, 77:18, 79:15, 80:10, 93:19, 97:2, 105:17, 106:13, 107:19, 121:14, 124:7, 128:17, 152:3, 154:21, 159:17</p> <p><b>expertise</b> [2] - 22:5, 138:10</p> <p><b>experts</b> [3] - 25:4, 26:9, 105:18</p> <p><b>explain</b> [16] - 7:20, 12:21, 17:4, 17:16, 18:5, 20:25, 39:8, 48:24, 52:12, 74:8, 90:3, 99:18, 102:2, 108:25, 111:7, 112:19</p> <p><b>explained</b> [3] - 55:11, 116:25, 130:11</p> <p><b>explanation</b> [1] - 121:3</p> <p><b>explanatory</b> [1] - 57:16</p> <p><b>explore</b> [1] - 115:1</p> <p><b>exposed</b> [4] - 28:25, 34:9, 46:13, 46:14</p> <p><b>exposure</b> [1] - 29:19</p> <p><b>expressed</b> [3] - 118:22, 119:15, 119:23</p> <p><b>expression</b> [1] - 16:17</p> <p><b>extend</b> [1] - 66:12</p> <p><b>extends</b> [2] - 65:17, 68:21</p> <p><b>extensive</b> [2] - 122:11, 122:13</p> <p><b>extent</b> [8] - 33:17, 65:23, 77:8, 136:4, 136:12, 140:20, 140:23, 141:19</p> <p><b>extraction</b> [14] - 61:7, 61:22, 62:4, 62:16, 62:17, 62:19, 62:20, 89:22, 89:25, 90:8, 93:16, 117:24, 118:3</p> <p><b>extremely</b> [4] - 12:12, 54:1, 54:14, 61:22</p> <p><b>Exxon</b> [40] - 5:10, 64:8, 64:12, 65:11, 66:8, 66:20, 67:18, 68:13, 70:15, 70:25, 71:13, 71:16, 71:22, 72:10, 75:15, 76:10, 77:3, 77:22, 79:6, 80:8, 82:24, 83:17, 85:12, 85:17, 86:10, 86:15, 87:1,</p>	<p>89:20, 90:21, 91:5, 93:21, 95:4, 118:12, 118:14, 122:11, 133:18, 137:17, 137:22, 162:18, 171:13</p> <p><b>Exxon's</b> [1] - 91:2</p> <p><b>ExxonMobil</b> [68] - 2:8, 2:8, 4:22, 4:25, 11:14, 66:14, 66:22, 68:2, 68:18, 68:22, 69:6, 74:10, 75:2, 76:18, 76:23, 77:20, 78:8, 78:12, 79:15, 80:12, 81:17, 82:13, 87:14, 87:19, 91:22, 93:25, 96:21, 105:4, 132:12, 132:17, 133:5, 134:21, 135:17, 136:20, 136:25, 137:6, 137:14, 142:4, 142:17, 145:8, 145:14, 148:13, 148:18, 149:4, 150:23, 151:24, 154:14, 154:17, 154:22, 155:25, 156:5, 156:12, 156:19, 157:4, 160:13, 161:25, 162:13, 163:9, 164:12, 164:14, 164:19, 165:7, 165:9, 165:15, 167:1, 171:15, 172:16, 173:21</p> <p><b>ExxonMobil's</b> [2] - 68:24, 105:18</p>	<p>65:7, 150:2</p> <p><b>family</b> [1] - 68:7</p> <p><b>far</b> [7] - 22:13, 23:7, 35:25, 36:17, 83:21, 83:23, 146:23</p> <p><b>Farley</b> [1] - 4:16</p> <p><b>FARLEY</b> [2] - 1:19, 4:16</p> <p><b>Farms</b> [4] - 2:11, 5:3, 5:11, 48:8</p> <p><b>farthest</b> [1] - 141:18</p> <p><b>fashion</b> [1] - 108:2</p> <p><b>faster</b> [3] - 60:17, 131:19, 131:25</p> <p><b>fate</b> [4] - 31:19, 32:3, 42:3, 46:20</p> <p><b>faulted</b> [1] - 70:5</p> <p><b>feasibility</b> [11] - 23:17, 23:23, 24:9, 55:22, 87:22, 88:7, 121:7, 121:10, 121:13</p> <p><b>feasible</b> [2] - 17:14, 21:20</p> <p><b>features</b> [1] - 52:9</p> <p><b>federal</b> [3] - 29:9, 29:24, 39:25</p> <p><b>feet</b> [17] - 43:13, 43:16, 43:17, 43:23, 43:25, 45:15, 53:5, 53:6, 54:10, 67:2, 69:1, 71:25, 83:24, 83:25, 94:14, 99:6, 112:7</p> <p><b>felt</b> [10] - 59:13, 60:1, 69:9, 84:11, 94:2, 139:2, 166:9, 171:14, 172:4, 172:17</p> <p><b>fenton</b> [1] - 63:16</p> <p><b>few</b> [10] - 53:5, 54:11, 55:1, 67:8, 70:21, 74:15, 94:14, 132:10, 170:4, 170:11</p> <p><b>fewer</b> [1] - 131:10</p> <p><b>field</b> [14] - 8:1, 11:19, 17:11, 18:19, 20:16, 26:20, 31:20, 32:14, 41:21, 46:15, 50:24, 51:10, 138:9, 172:25</p> <p><b>fields</b> [1] - 10:20</p> <p><b>Figure</b> [6] - 149:17, 149:21, 150:2, 152:3, 152:10, 152:13</p> <p><b>figure</b> [8] - 12:23, 64:15, 66:5, 67:11, 68:20, 71:15, 149:14, 150:5</p>	<p><b>file</b> [5] - 65:24, 115:25, 139:19, 167:5</p> <p><b>filed</b> [3] - 9:23, 128:17, 160:8</p> <p><b>files</b> [1] - 167:3</p> <p><b>fill</b> [1] - 174:16</p> <p><b>filter</b> [2] - 81:4, 81:11</p> <p><b>filters</b> [1] - 81:7</p> <p><b>final</b> [1] - 168:6</p> <p><b>finalized</b> [1] - 108:14</p> <p><b>financially</b> [1] - 177:14</p> <p><b>finder</b> [1] - 135:3</p> <p><b>fine</b> [5] - 7:9, 10:12, 109:21, 175:6, 175:7</p> <p><b>finer</b> [2] - 14:11, 111:15</p> <p><b>finish</b> [5] - 128:1, 136:21, 137:1, 137:7, 159:21</p> <p><b>finished</b> [2] - 8:25, 29:16</p> <p><b>finite</b> [3] - 44:20, 78:21, 125:2</p> <p><b>firm</b> [5] - 4:21, 9:3, 9:7, 17:17, 17:18</p> <p><b>firms</b> [1] - 8:24</p> <p><b>first</b> [39] - 6:2, 14:4, 17:23, 18:24, 20:12, 26:19, 27:4, 27:10, 28:2, 28:22, 29:15, 31:21, 36:19, 39:11, 41:4, 41:13, 44:5, 47:11, 55:14, 62:11, 64:8, 67:11, 68:24, 73:18, 77:12, 77:13, 84:25, 88:21, 95:1, 104:13, 104:15, 112:21, 120:15, 120:20, 120:21, 123:3, 128:4, 129:6, 140:6</p> <p><b>fish</b> [1] - 81:4</p> <p><b>FISHER</b> [1] - 1:10</p> <p><b>fit</b> [1] - 96:19</p> <p><b>fits</b> [1] - 56:5</p> <p><b>five</b> [36] - 95:22, 100:14, 100:15, 101:1, 101:7, 106:8, 121:20, 122:23, 123:5, 128:6, 143:15, 143:17, 148:12, 149:3, 153:6, 153:13, 153:17, 157:23, 158:5, 158:23, 159:14, 160:16, 160:19, 160:23, 161:1, 161:10, 161:14, 161:19, 161:20, 161:22, 161:24, 164:6, 166:23, 168:25, 169:2, 169:6</p>
	<b>F</b>		
	<p><b>facies</b> [1] - 13:3</p> <p><b>fact</b> [27] - 15:1, 24:19, 24:22, 33:10, 42:21, 53:5, 57:22, 58:6, 58:17, 98:6, 104:12, 109:9, 112:24, 113:5, 127:6, 131:22, 135:3, 136:16, 146:10, 153:25, 154:17, 155:21, 156:2, 162:9, 169:5, 170:6</p> <p><b>factor</b> [2] - 45:24, 73:2</p> <p><b>factors</b> [7] - 19:18, 19:19, 55:6, 96:9, 98:17, 101:6, 122:7</p> <p><b>failed</b> [1] - 103:4</p> <p><b>fair</b> [4] - 118:21, 146:20, 157:13, 157:18</p> <p><b>fairly</b> [1] - 101:14</p> <p><b>falls</b> [2] - 136:7, 136:16</p> <p><b>familiar</b> [4] - 8:11, 48:23,</p>		

<b>five-minute</b> [1] - 128:6 <b>five-year</b> [2] - 166:23, 169:2 <b>fixed</b> [2] - 99:12, 173:13 <b>flat</b> [1] - 70:2 <b>flip</b> [1] - 156:7 <b>floating</b> [2] - 44:3, 61:12 <b>flow</b> [39] - 16:5, 16:8, 18:1, 18:15, 18:18, 18:20, 18:23, 18:24, 19:2, 19:15, 19:19, 20:10, 20:13, 20:14, 20:16, 46:22, 49:7, 50:19, 51:6, 57:8, 73:19, 73:24, 74:2, 74:4, 74:21, 74:23, 75:4, 75:6, 75:11, 75:16, 75:25, 76:2, 77:6, 84:25, 85:9, 119:12, 119:19, 120:1, 120:10 <b>flowed</b> [1] - 48:11 <b>flowing</b> [3] - 19:16, 46:16, 85:1 <b>flows</b> [1] - 20:3 <b>fluid</b> [1] - 51:22 <b>FLUTe</b> [45] - 101:12, 101:13, 101:14, 101:23, 102:2, 102:13, 102:20, 102:25, 104:5, 104:9, 104:13, 104:16, 104:21, 105:8, 105:10, 105:13, 105:20, 106:2, 143:20, 143:24, 144:1, 144:9, 144:10, 144:12, 144:16, 144:25, 145:5, 145:17, 145:21, 145:24, 146:6, 146:10, 146:22, 147:18, 148:25, 150:14, 150:16, 150:19, 151:4, 151:14, 151:15, 151:17, 152:19, 153:1, 154:25 <b>FLUTes</b> [1] - 146:24 <b>flux</b> [1] - 133:19 <b>FLW)(LHG</b> [1] - 1:2 <b>focus</b> [2] - 8:5, 57:11 <b>focused</b> [1] - 84:5 <b>focusing</b> [1] - 13:16 <b>follow</b> [3] - 20:22, 121:7, 123:19 <b>followed</b> [2] - 31:10, 112:18 <b>FOLLOWING</b> [1] - 3:8 <b>follows</b> [1] - 6:3 <b>FOR</b> [1] - 1:1	<b>forces</b> [1] - 70:3 <b>foregoing</b> [1] - 177:6 <b>forever</b> [2] - 135:8, 135:13 <b>form</b> [6] - 14:7, 27:1, 59:5, 86:15, 127:16, 175:3 <b>format</b> [1] - 72:5 <b>Formation</b> [1] - 111:20 <b>formed</b> [1] - 91:3 <b>forming</b> [1] - 117:17 <b>forms</b> [1] - 34:10 <b>formula</b> [5] - 22:11, 51:6, 51:7, 51:9, 51:12 <b>formulas</b> [1] - 50:23 <b>forth</b> [3] - 140:18, 141:10, 177:9 <b>forward</b> [4] - 94:5, 164:15, 165:2, 167:21 <b>foundation</b> [6] - 79:11, 79:12, 79:14, 79:16, 79:20, 114:14 <b>four</b> [8] - 17:1, 27:4, 31:12, 31:13, 120:21, 128:25, 149:3, 153:14 <b>four-year</b> [1] - 128:25 <b>fracture</b> [12] - 15:9, 16:11, 20:21, 52:2, 52:4, 52:9, 52:17, 52:20, 73:5, 73:7, 73:10, 142:14 <b>fractured</b> [15] - 14:21, 14:23, 15:5, 15:15, 15:19, 15:25, 20:9, 51:18, 53:1, 53:9, 53:25, 54:13, 54:16, 66:24, 73:4 <b>fractures</b> [13] - 14:16, 14:19, 15:6, 15:12, 15:21, 16:7, 16:18, 20:14, 20:15, 52:5, 52:23, 54:20, 55:2 <b>framework</b> [2] - 139:4, 140:16 <b>Franklin</b> [1] - 106:23 <b>FREDA</b> [1] - 1:12 <b>free</b> [2] - 115:1, 129:17 <b>French</b> [1] - 51:4 <b>frequency</b> [1] - 167:22 <b>frequently</b> [1] - 126:5 <b>fringe</b> [2] - 13:13, 61:13 <b>front</b> [1] - 89:5 <b>fuel</b> [1] - 22:16 <b>full</b> [4] - 6:16, 6:20,	138:24, 164:24 <b>fully</b> [5] - 137:13, 138:4, 138:21, 142:25, 151:22 <b>funds</b> [3] - 126:12, 157:1, 164:21 <b>furthest</b> [1] - 84:16 <b>future</b> [7] - 32:18, 32:23, 92:4, 134:15, 166:12, 167:15, 169:18	43:19, 45:13, 85:7, 98:11, 102:4, 103:21, 120:5 <b>gentleman</b> [2] - 51:3, 104:10 <b>geographic</b> [1] - 67:16 <b>geographically</b> [1] - 146:18 <b>geography</b> [1] - 8:4 <b>geologic</b> [8] - 14:1, 14:3, 14:12, 34:2, 69:25, 70:10, 70:11, 70:13 <b>geological</b> [1] - 13:24 <b>geologically</b> [1] - 146:18 <b>geology</b> [1] - 68:16 <b>geomorphology</b> [1] - 8:5 <b>Getty</b> [2] - 47:24, 48:16 <b>given</b> [4] - 38:7, 118:17, 124:15, 160:15 <b>glacial</b> [3] - 14:10, 111:14, 111:16 <b>global</b> [2] - 9:6, 9:9 <b>goal</b> [7] - 29:25, 30:24, 40:16, 55:15, 59:25, 61:23, 82:11 <b>goals</b> [1] - 40:7 <b>GOODWIN</b> [1] - 2:10 <b>Goodwin</b> [1] - 5:2 <b>GOTSHAL</b> [1] - 2:5 <b>Gotshal</b> [1] - 4:22 <b>government</b> [7] - 9:22, 26:4, 26:5, 28:10, 28:19, 28:22, 29:9 <b>governmental</b> [1] - 9:21 <b>grade</b> [1] - 23:2 <b>gradient</b> [4] - 19:10, 19:12, 116:11, 141:19 <b>graduate</b> [1] - 8:25 <b>grain</b> [1] - 111:14 <b>grained</b> [1] - 14:11 <b>grains</b> [1] - 13:3 <b>granular</b> [3] - 80:25, 81:9, 99:7 <b>granules</b> [1] - 81:5 <b>graph</b> [1] - 72:8 <b>graphic</b> [1] - 52:25 <b>gravel</b> [1] - 111:15 <b>gravels</b> [1] - 14:5 <b>greater</b> [4] - 95:2, 98:12, 102:9, 173:3 <b>GREINER</b> [1] - 2:7 <b>Greiner</b> [1] - 4:24 <b>ground</b> [6] - 12:24,
--	---	---	--

45:16, 64:2, 81:2, 81:3, 111:12 <b>groundwater</b> [163] - 9:1, 9:24, 10:17, 13:9, 13:21, 15:22, 16:5, 16:8, 17:13, 17:15, 18:1, 18:7, 18:13, 18:18, 18:20, 18:23, 19:6, 19:7, 19:9, 19:15, 19:16, 19:19, 19:20, 19:25, 20:13, 20:14, 20:16, 21:2, 21:3, 21:21, 21:24, 22:2, 23:15, 23:17, 23:25, 24:4, 27:10, 27:19, 27:21, 30:8, 30:20, 31:6, 32:5, 34:2, 34:22, 34:25, 35:6, 35:16, 36:23, 37:2, 37:5, 37:8, 37:11, 37:13, 37:14, 37:18, 37:19, 38:11, 38:12, 39:5, 40:2, 40:10, 40:18, 41:24, 43:5, 44:3, 44:6, 44:23, 45:19, 45:20, 45:22, 45:23, 46:4, 46:22, 48:22, 48:24, 49:7, 50:2, 50:11, 50:16, 50:19, 50:21, 50:22, 50:25, 51:1, 51:7, 51:8, 51:12, 52:21, 56:19, 56:25, 57:1, 57:2, 57:3, 57:7, 57:18, 57:20, 58:3, 58:7, 59:14, 60:2, 61:12, 62:3, 62:10, 62:14, 62:22, 63:1, 71:6, 72:23, 73:19, 73:24, 73:25, 74:1, 74:2, 74:4, 74:21, 75:4, 75:6, 77:6, 79:1, 80:13, 80:19, 81:13, 81:18, 82:1, 84:25, 85:1, 85:9, 90:6, 90:7, 90:9, 90:10, 93:15, 95:7, 103:17, 116:13, 116:14, 117:12, 118:5, 118:10, 119:10, 119:12, 119:14, 119:17, 120:10, 120:13, 124:11, 124:16, 125:2, 125:5, 136:19, 141:14, 141:15, 141:19, 141:22, 154:20, 162:11, 162:19, 168:19 <b>growing</b> [1] - 12:25 <b>guidance</b> [2] - 107:17, 171:23 <b>guide</b> [1] - 108:22	<b>guidelines</b> [1] - 24:8 <b>Gulf</b> [23] - 2:11, 5:3, 106:19, 110:8, 110:10, 116:11, 116:15, 116:16, 117:1, 117:4, 117:16, 117:18, 117:21, 118:18, 119:18, 121:7, 122:3, 122:10, 124:19, 124:20, 125:15, 125:19, 126:3 <b>guys</b> [1] - 45:8 <b>Gwen</b> [1] - 4:16 <b>GWEN</b> [1] - 1:19	116:5, 116:12, 117:11, 118:3, 122:2, 142:13, 172:4 <b>higher</b> [8] - 15:12, 19:21, 40:11, 79:2, 122:20, 127:6, 132:23, 171:14 <b>highest</b> [1] - 78:7 <b>highly</b> [4] - 35:4, 36:19, 84:11, 85:9 <b>hill</b> [6] - 19:11, 20:18, 20:19, 20:21, 50:13 <b>hired</b> [1] - 129:21 <b>historical</b> [2] - 112:15, 113:10 <b>historically</b> [6] - 70:1, 77:2, 83:20, 85:3, 115:15, 132:23 <b>history</b> [9] - 41:6, 41:7, 41:9, 41:11, 102:15, 103:13, 106:25, 107:8, 118:7 <b>hit</b> [1] - 159:20 <b>hole</b> [16] - 68:3, 94:11, 101:19, 101:21, 101:22, 102:5, 102:23, 103:4, 104:24, 105:12, 105:13, 144:2, 144:4, 144:14, 146:3 <b>holes</b> [5] - 82:17, 83:2, 94:13, 143:17, 146:5 <b>home</b> [1] - 81:8 <b>honestly</b> [1] - 152:20 <b>Honor</b> [39] - 4:9, 4:20, 4:23, 5:1, 5:19, 6:6, 6:19, 7:3, 10:7, 10:12, 10:20, 11:2, 36:9, 45:4, 47:18, 48:18, 64:3, 79:10, 79:20, 97:8, 106:11, 106:22, 107:10, 108:6, 108:15, 108:21, 123:18, 128:1, 128:5, 129:11, 138:7, 139:22, 146:20, 147:12, 157:13, 157:19, 168:1, 174:1, 174:24 <b>HONORABLE</b> [1] - 1:12 <b>hope</b> [2] - 103:12, 161:17 <b>hopefully</b> [1] - 162:15 <b>hoping</b> [2] - 6:18, 161:23 <b>horizontal</b> [1] - 14:18 <b>horizontally</b> [1] - 70:2 <b>House</b> [2] - 12:15, 12:18 <b>house</b> [1] - 98:10	<b>hundred</b> [1] - 54:11 <b>hundreds</b> [3] - 36:11, 59:19, 103:25 <b>hunt</b> [1] - 7:1 <b>hydraulic</b> [2] - 20:1, 20:2 <b>hydrocarbons</b> [4] - 36:1, 36:7, 36:14 <b>hydrogen</b> [2] - 36:13, 63:16 <b>hydrogeologic</b> [2] - 46:22, 122:8 <b>hydrogeological</b> [2] - 111:8, 120:10 <b>hydrogeology</b> [4] - 17:25, 73:3, 73:24, 111:6 <b>hydrologist</b> [1] - 7:19 <b>hydrology</b> [6] - 7:22, 8:5, 8:9, 10:17, 19:24, 34:3
	<b>H</b>		<b>I</b>
	<b>half</b> [1] - 155:9 <b>hand</b> [1] - 42:6 <b>handing</b> [1] - 160:7 <b>handled</b> [1] - 9:11 <b>handout</b> [1] - 42:6 <b>hands</b> [1] - 119:1 <b>hard</b> [2] - 58:11, 99:12 <b>hardly</b> [1] - 36:20 <b>head</b> [8] - 20:1, 20:2, 20:4, 20:5, 50:11, 97:5, 97:25, 147:24 <b>heading</b> [1] - 88:1 <b>heads</b> [1] - 147:8 <b>health</b> [2] - 29:23, 88:12 <b>hear</b> [1] - 35:1 <b>HEARING</b> [1] - 1:4 <b>hearing</b> [6] - 5:8, 5:13, 47:24, 147:8, 147:14, 168:7 <b>held</b> [1] - 8:23 <b>help</b> [2] - 33:8, 72:19 <b>helped</b> [2] - 162:10, 162:18 <b>helpful</b> [2] - 47:18, 150:18 <b>hence</b> [1] - 94:15 <b>Henri</b> [1] - 51:3 <b>Henry's</b> [1] - 37:10 <b>hereby</b> [1] - 177:5 <b>hereinbefore</b> [1] - 177:8 <b>HERRMANN</b> [1] - 1:16 <b>Herrmann</b> [1] - 4:14 <b>HESS</b> [1] - 1:7 <b>high</b> [24] - 19:25, 20:1, 35:9, 47:10, 57:8, 62:20, 62:25, 63:9, 80:1, 88:5, 88:19, 89:9, 89:18, 90:19, 103:21, 104:7,		<b>ideal</b> [1] - 135:6 <b>identical</b> [5] - 12:1, 24:21, 25:3, 26:13, 113:6 <b>identification</b> [4] - 6:9, 140:2, 149:19, 152:8 <b>Identification</b> [1] - 176:10 <b>identifications</b> [1] - 141:17 <b>identified</b> [15] - 17:10, 23:13, 47:10, 47:11, 48:12, 68:24, 71:20, 112:1, 112:5, 112:15, 116:10, 146:15, 148:10, 151:13, 170:15 <b>identifies</b> [1] - 141:16 <b>identify</b> [8] - 16:15, 32:8, 32:10, 32:13, 33:25, 105:19, 141:13, 167:20 <b>identifying</b> [2] - 27:5, 122:17 <b>ignorance</b> [1] - 147:10 <b>Illinois</b> [1] - 16:4 <b>illustration</b> [1] - 48:24 <b>imagine</b> [1] - 49:12 <b>immediately</b> [4] - 80:2, 80:3, 80:16, 143:23 <b>impact</b> [5] - 34:21, 72:23, 73:13, 142:15, 155:5 <b>impacted</b> [6] - 26:3, 27:11, 27:15, 49:13,

<p>57:5, 75:19  <b>Imperial</b> [5] - 8:8, 8:10, 8:14, 8:16, 8:22  <b>implement</b> [6] - 29:11, 31:14, 59:5, 88:14, 126:12, 155:19  <b>implementability</b> [5] - 24:10, 24:12, 88:13, 89:13, 89:19  <b>implementation</b> [4] - 25:19, 88:15, 88:16, 173:6  <b>implemented</b> [16] - 11:17, 17:11, 32:14, 32:21, 40:9, 41:12, 54:21, 72:15, 89:15, 89:20, 89:23, 90:23, 124:23, 132:17, 134:20, 162:12  <b>implementing</b> [5] - 26:16, 78:12, 126:11, 154:23, 171:4  <b>implements</b> [1] - 45:2  <b>implications</b> [1] - 55:4  <b>importance</b> [1] - 79:3  <b>important</b> [13] - 18:16, 18:20, 28:18, 30:24, 31:1, 32:9, 34:15, 37:6, 41:7, 41:8, 58:15, 58:16, 109:2  <b>imposed</b> [2] - 29:8, 135:14  <b>improve</b> [1] - 65:4  <b>impurity</b> [1] - 28:8  <b>IN</b> [1] - 3:9  <b>in-situ</b> [6] - 53:18, 53:20, 53:22, 62:6, 62:8, 63:6  <b>inadvertently</b> [1] - 119:12  <b>inappropriate</b> [1] - 107:18  <b>Inc</b> [1] - 2:11  <b>include</b> [10] - 46:9, 90:25, 95:15, 109:6, 115:20, 118:15, 119:20, 140:24, 165:10, 168:7  <b>included</b> [9] - 88:2, 88:3, 113:14, 124:4, 153:16, 163:18, 164:17, 164:24, 166:22  <b>includes</b> [1] - 161:19  <b>including</b> [8] - 12:8, 44:25, 65:15, 65:19,</p>	<p>112:6, 115:24, 140:25, 141:18  <b>inconsistent</b> [1] - 156:18  <b>incorrect</b> [1] - 129:12  <b>increased</b> [1] - 50:22  <b>independently</b> [2] - 155:25, 156:12  <b>indicate</b> [4] - 31:9, 32:7, 56:16, 75:25  <b>indicated</b> [7] - 17:22, 20:11, 57:13, 59:13, 71:25, 117:3, 133:6  <b>indication</b> [4] - 8:13, 43:8, 43:10, 171:21  <b>individual</b> [15] - 56:17, 74:20, 82:23, 85:24, 86:1, 94:23, 104:23, 121:13, 143:8, 145:4, 145:6, 145:18, 146:5, 146:8, 146:14  <b>industries</b> [1] - 23:8  <b>industry</b> [3] - 25:1, 25:12, 41:24  <b>inference</b> [2] - 19:22, 30:13  <b>inferred</b> [2] - 18:24, 19:13  <b>information</b> [35] - 16:12, 17:7, 17:9, 17:21, 17:23, 18:2, 19:14, 26:20, 26:25, 31:11, 31:15, 33:1, 33:5, 33:7, 33:9, 33:17, 33:20, 33:22, 33:24, 34:5, 40:21, 41:10, 50:24, 60:1, 77:10, 86:6, 90:12, 107:14, 107:25, 108:13, 112:1, 119:7, 127:11, 147:17, 155:9  <b>infrastructure</b> [2] - 9:9, 89:3  <b>inherent</b> [1] - 171:3  <b>initial</b> [8] - 23:22, 85:16, 98:4, 111:12, 128:17, 132:6, 132:14, 140:8  <b>inject</b> [1] - 63:8  <b>injected</b> [1] - 62:9  <b>injecting</b> [5] - 49:18, 60:6, 60:9, 61:1, 63:15  <b>injection</b> [3] - 49:17, 61:6, 62:12  <b>injects</b> [1] - 63:7  <b>innovative</b> [1] - 101:14</p>	<p><b>inquired</b> [1] - 5:12  <b>inquiry</b> [1] - 48:6  <b>insert</b> [3] - 64:16, 107:6, 144:5  <b>install</b> [15] - 47:1, 67:24, 68:4, 81:21, 82:17, 135:18, 146:14, 156:1, 156:19, 156:20, 156:24, 164:6, 165:24, 166:11, 166:16  <b>installation</b> [4] - 99:5, 99:7, 135:24, 165:21  <b>installed</b> [55] - 19:5, 42:23, 47:9, 65:12, 66:14, 67:25, 74:11, 74:12, 74:16, 75:3, 81:25, 83:20, 96:4, 103:12, 103:22, 103:23, 104:6, 110:7, 110:8, 120:23, 122:15, 123:3, 125:19, 125:24, 126:3, 130:8, 136:3, 138:4, 138:21, 139:7, 139:12, 142:1, 142:7, 142:12, 143:1, 143:2, 143:23, 144:16, 150:10, 150:14, 150:20, 151:1, 151:23, 152:15, 152:19, 153:1, 153:7, 154:1, 154:4, 154:18, 155:1, 155:8, 156:2, 163:9, 163:21  <b>installing</b> [11] - 48:10, 82:4, 88:25, 89:2, 103:20, 144:20, 145:4, 145:18, 146:8, 153:16, 153:22  <b>instances</b> [1] - 150:12  <b>instead</b> [3] - 78:24, 78:25, 104:21  <b>institutions</b> [1] - 8:18  <b>intended</b> [3] - 51:20, 103:11, 141:13  <b>intent</b> [3] - 61:5, 141:13, 141:21  <b>intercept</b> [6] - 49:14, 52:19, 54:3, 54:6, 63:22, 76:14  <b>intercepted</b> [3] - 52:3, 73:6, 142:14  <b>intercepts</b> [3] - 52:17, 76:16, 76:21  <b>interconnected</b> [3] - 14:20, 52:5, 54:20</p>	<p><b>interconnection</b> [1] - 15:2  <b>interested</b> [1] - 177:14  <b>intermediate</b> [2] - 116:6, 120:3  <b>interrupt</b> [2] - 10:2, 45:9  <b>interrupted</b> [1] - 45:5  <b>intersection</b> [1] - 66:9  <b>intersects</b> [1] - 15:11  <b>interval</b> [1] - 104:24  <b>intervals</b> [2] - 84:21, 163:7  <b>introduce</b> [1] - 103:16  <b>introduced</b> [1] - 64:24  <b>introducing</b> [1] - 53:21  <b>investigate</b> [2] - 11:22, 105:6  <b>investigated</b> [3] - 45:18, 68:23, 145:8  <b>investigating</b> [1] - 115:9  <b>investigation</b> [44] - 11:18, 25:19, 26:16, 32:20, 32:22, 32:23, 33:3, 41:6, 41:11, 41:13, 47:14, 72:7, 74:10, 76:18, 80:5, 82:10, 82:11, 82:15, 82:25, 83:10, 83:13, 84:6, 86:21, 87:14, 92:6, 98:3, 116:4, 122:16, 126:11, 129:22, 132:4, 133:4, 136:14, 139:20, 140:8, 140:14, 142:1, 142:9, 142:20, 144:17, 145:14, 167:4, 167:10, 173:5  <b>investigations</b> [3] - 17:11, 26:21, 145:15  <b>investigative</b> [2] - 26:17, 26:18  <b>invited</b> [1] - 12:18  <b>involve</b> [1] - 9:19  <b>involved</b> [2] - 48:8, 135:7  <b>involves</b> [2] - 121:18, 123:24  <b>iota</b> [1] - 109:9  <b>irrelevant</b> [1] - 89:16  <b>irrespective</b> [1] - 165:2  <b>IS</b> [1] - 3:8  <b>issue</b> [7] - 53:22, 91:20, 91:23, 95:25, 129:12, 167:24, 173:17  <b>issued</b> [5] - 128:22, 132:6, 133:14, 158:2,</p>
--	---	--	--

<p>164:10  <b>issues</b> [8] - 91:25,  112:20, 138:14, 148:7,  148:22, 157:9, 173:1,  173:4  <b>it'</b> [1] - 52:2  <b>item</b> [6] - 27:4, 97:4,  97:20, 99:7, 99:11,  100:21  <b>items</b> [7] - 31:12, 41:17,  93:22, 99:2, 99:5, 99:9,  99:19  <b>itself</b> [10] - 27:3, 27:10,  37:2, 42:20, 62:22, 67:4,  83:19, 89:4, 117:21,  169:8</p>	<p>147:10  <b>keep</b> [1] - 111:9  <b>key</b> [6] - 19:19, 19:24,  55:6, 73:2, 85:20,  113:16  <b>kicker</b> [1] - 170:25  <b>kind</b> [3] - 29:11, 53:13,  67:10  <b>kinds</b> [1] - 168:7  <b>Kingdom</b> [1] - 8:4  <b>Kings</b> [1] - 8:3  <b>Kleinfelder</b> [2] - 139:24,  140:5  <b>Knopf</b> [1] - 4:14  <b>KNOPF</b> [1] - 1:16  <b>knowledge</b> [1] - 139:10  <b>known</b> [1] - 23:9  <b>knows</b> [1] - 131:2  <b>Komex</b> [1] - 9:5</p>	<p><b>layered</b> [1] - 69:11  <b>layers</b> [21] - 69:3, 69:4,  69:8, 69:20, 70:1, 70:4,  70:7, 74:1, 74:3, 74:12,  74:15, 82:18, 82:19,  82:22, 82:23, 83:4,  103:6, 103:8, 151:7,  151:13, 151:16  <b>layman</b> [1] - 111:10  <b>lays</b> [2] - 172:5, 172:7  <b>leading</b> [1] - 114:15  <b>leak</b> [2] - 44:19, 51:25  <b>leaking</b> [2] - 44:19, 51:25  <b>learned</b> [1] - 72:13  <b>least</b> [6] - 39:1, 41:18,  42:10, 140:22, 158:5,  160:16  <b>left</b> [5] - 15:11, 52:10,  64:15, 78:17, 107:3  <b>legal</b> [7] - 119:6, 126:21,  129:11, 138:24, 148:1,  166:8, 167:23  <b>legally</b> [1] - 164:19  <b>Lender</b> [2] - 4:21, 176:6  <b>LENDER</b> [38] - 2:6, 4:20,  10:24, 47:18, 79:10,  79:14, 128:5, 128:16,  129:24, 138:18, 138:19,  139:22, 140:3, 146:20,  146:23, 147:4, 147:7,  147:22, 148:5, 148:11,  149:13, 149:21, 150:1,  152:9, 152:22, 156:6,  157:13, 157:18, 157:20,  159:2, 159:7, 159:8,  161:12, 168:1, 168:10,  168:12, 174:1, 174:21  <b>lengthy</b> [2] - 113:15,  168:5  <b>LEONARD</b> [1] - 1:17  <b>Leonard</b> [1] - 4:13  <b>less</b> [8] - 105:14, 105:16,  145:25, 146:7, 170:22,  173:11, 173:12, 173:15  <b>letting</b> [1] - 59:22  <b>level</b> [19] - 19:20, 28:19,  29:2, 29:3, 29:24, 29:25,  30:10, 30:11, 30:13,  39:25, 59:18, 59:24,  65:7, 74:20, 81:12,  101:15, 122:20, 144:21,  144:23  <b>levels</b> [12] - 19:8, 28:23,</p>	<p>30:1, 35:9, 40:15, 75:24,  80:1, 103:24, 104:7,  118:4, 120:11, 122:3  <b>licensed</b> [4] - 129:6,  129:7, 129:13, 129:19  <b>LIFLAND</b> [1] - 1:16  <b>Lifland</b> [1] - 4:14  <b>Light</b> [1] - 42:13  <b>likely</b> [8] - 84:11, 85:9,  85:13, 86:11, 90:12,  99:2, 134:9, 161:21  <b>limit</b> [5] - 30:15, 30:17,  32:11, 32:16, 39:16  <b>Limited</b> [2] - 2:11, 5:3  <b>limited</b> [7] - 30:15, 39:14,  48:5, 82:12, 126:2,  171:11, 171:12  <b>limiting</b> [2] - 72:22, 92:8  <b>limits</b> [1] - 155:22  <b>line</b> [9] - 12:24, 68:9,  87:7, 97:20, 99:7, 99:9,  99:11, 99:19, 99:20  <b>linear</b> [1] - 52:8  <b>lines</b> [3] - 51:19, 67:13  <b>Liquid</b> [1] - 42:14  <b>Liquor</b> [1] - 71:21  <b>list</b> [10] - 27:4, 31:11,  31:18, 37:4, 40:21,  57:14, 85:21, 86:3, 90:3,  97:1  <b>listed</b> [5] - 42:11, 63:19,  88:4, 89:21, 90:13  <b>listing</b> [2] - 33:21, 114:4  <b>literally</b> [10] - 35:8,  45:21, 46:25, 53:1, 61:1,  63:2, 65:6, 74:5, 81:11,  103:16  <b>literature</b> [1] - 49:3  <b>litigation</b> [1] - 45:1  <b>Livingston</b> [66] - 48:7,  48:13, 64:8, 64:12,  65:11, 66:8, 66:18,  66:20, 67:6, 67:18,  67:20, 68:13, 70:12,  70:16, 70:25, 71:8,  71:13, 71:16, 71:23,  76:10, 77:3, 82:14,  83:12, 83:22, 84:13,  84:17, 85:6, 85:10,  85:12, 86:16, 87:16,  87:18, 118:12, 128:4,  128:18, 129:2, 130:9,</p>
<b>J</b>			
<p><b>January</b> [1] - 128:19  <b>JANUARY</b> [1] - 1:5  <b>Jersey</b> [24] - 4:11, 4:14,  4:17, 4:19, 13:22, 14:2,  14:13, 14:23, 28:15,  30:3, 30:10, 39:6, 39:23,  40:1, 45:17, 64:13,  64:16, 106:24, 107:6,  111:22, 129:10, 129:20,  156:25, 177:5  <b>JERSEY</b> [3] - 1:1, 1:4,  1:18  <b>job</b> [2] - 68:7, 69:15  <b>Judge</b> [1] - 169:1  <b>judgment</b> [2] - 109:10,  151:8  <b>July</b> [2] - 77:23, 112:23  <b>justified</b> [1] - 133:1</p>			
<b>K</b>	<b>L</b>		
<p><b>Kankakee</b> [1] - 16:4  <b>Kaplan</b> [24] - 114:3,  114:7, 114:9, 114:11,  115:4, 116:1, 116:4,  117:2, 118:20, 119:1,  119:5, 119:21, 122:16,  123:17, 123:24, 125:7,  125:8, 125:14, 125:24,  126:2, 126:9, 126:14,  126:18, 127:3  <b>Kaplan's</b> [1] - 127:17  <b>Kaufman</b> [1] - 4:13  <b>KAUFMANN</b> [5] - 1:17,  4:13, 129:11, 138:7,</p>	<p><b>lab</b> [3] - 113:1, 115:19,  115:22  <b>labeled</b> [2] - 68:20, 69:4  <b>laboratory</b> [2] - 30:12,  30:16  <b>labs</b> [2] - 39:14, 115:20  <b>lack</b> [1] - 38:4  <b>laid</b> [1] - 53:12  <b>lake</b> [1] - 27:18  <b>land</b> [1] - 34:7  <b>large</b> [14] - 9:6, 14:25,  18:11, 19:1, 21:11,  27:15, 36:15, 38:3, 43:3,  99:2, 116:18, 116:19,  144:4, 172:19  <b>larger</b> [6] - 38:5, 38:18,  43:8, 105:13, 146:3,  172:3  <b>largest</b> [1] - 23:4  <b>last</b> [8] - 57:9, 63:19,  70:21, 110:23, 155:8,  170:4, 170:11, 170:20  <b>late</b> [1] - 65:2  <b>latest</b> [3] - 114:3, 152:11,  169:15  <b>law</b> [1] - 4:21  <b>lawyers</b> [1] - 174:18  <b>lay</b> [1] - 79:19  <b>layer</b> [6] - 74:21, 74:22,  75:15, 75:24, 76:2,  103:2</p>		

<p>130:13, 131:19, 131:24, 132:6, 132:20, 132:22, 132:24, 133:2, 133:6, 133:13, 133:18, 135:21, 136:21, 137:1, 137:7, 137:21, 139:19, 140:5, 142:24, 143:20, 152:15, 152:23, 162:1, 162:10, 163:3, 172:11, 172:12, 174:18</p> <p><b>LLP</b> [3] - 1:16, 2:5, 2:10</p> <p><b>LNAPL</b> [8] - 42:11, 42:13, 43:12, 44:15, 45:3, 62:1, 62:19, 62:25</p> <p><b>loading</b> [1] - 78:25</p> <p><b>local</b> [2] - 34:6, 99:12</p> <p><b>located</b> [7] - 53:15, 77:24, 106:23, 111:11, 150:16, 150:17, 153:4</p> <p><b>location</b> [25] - 14:21, 34:1, 47:3, 47:9, 49:13, 64:17, 64:25, 74:16, 76:9, 84:24, 96:1, 104:6, 107:5, 107:8, 110:3, 117:11, 121:4, 148:9, 149:5, 151:15, 153:12, 153:13, 154:19, 154:23, 163:17</p> <p><b>locations</b> [26] - 18:11, 74:15, 83:4, 83:8, 83:9, 84:20, 95:13, 105:3, 108:1, 125:22, 136:1, 141:16, 144:3, 144:14, 146:15, 148:13, 148:14, 148:15, 148:17, 150:8, 150:14, 151:4, 151:15, 156:1, 163:2, 163:10</p> <p><b>London</b> [3] - 8:4, 8:8, 8:10</p> <p><b>long-term</b> [1] - 88:21</p> <p><b>look</b> [22] - 40:14, 46:20, 51:20, 52:10, 67:11, 67:17, 68:8, 75:13, 75:23, 86:16, 108:4, 113:3, 114:23, 119:10, 124:18, 135:15, 152:2, 152:6, 152:18, 164:20, 166:18, 171:24</p> <p><b>looked</b> [5] - 67:12, 71:2, 81:4, 126:14, 172:12</p> <p><b>looking</b> [7] - 46:4, 59:25, 90:5, 105:23, 124:25, 146:21, 154:16</p>	<p><b>looks</b> [1] - 99:10</p> <p><b>loose</b> [1] - 14:7</p> <p><b>low</b> [13] - 15:10, 20:1, 30:16, 38:15, 39:14, 59:22, 60:16, 88:4, 88:19, 89:12, 89:13, 90:3, 112:24</p> <p><b>lower</b> [9] - 20:2, 37:21, 59:8, 65:5, 103:3, 116:6, 123:8, 127:1, 133:7</p> <p><b>lowering</b> [1] - 88:11</p> <p><b>lowers</b> [1] - 21:3</p> <p><b>lowest</b> [1] - 101:9</p> <p><b>LSRP</b> [52] - 129:3, 129:6, 129:13, 129:18, 129:19, 129:25, 134:16, 136:8, 136:17, 136:22, 137:2, 137:4, 137:9, 137:11, 137:12, 137:19, 138:5, 138:22, 139:9, 139:14, 139:18, 140:14, 141:24, 143:16, 147:2, 147:12, 147:20, 147:24, 150:20, 151:1, 151:8, 151:20, 152:18, 152:25, 153:22, 153:25, 155:13, 155:25, 156:8, 156:9, 156:11, 157:5, 159:24, 163:21, 164:10, 164:22, 165:20, 166:11, 167:3, 167:5, 167:11</p> <p><b>LSRP's</b> [1] - 137:25</p> <p><b>luncheon</b> [1] - 92:13</p>	<p><b>mapped</b> [1] - 67:16</p> <p><b>March</b> [5] - 139:17, 140:9, 140:10, 167:4, 167:7</p> <p><b>MARK</b> [1] - 2:10</p> <p><b>mark</b> [3] - 139:22, 149:14, 149:16</p> <p><b>Mark</b> [1] - 5:2</p> <p><b>marked</b> [5] - 64:9, 68:13, 140:1, 149:18, 152:7</p> <p><b>marking</b> [1] - 7:4</p> <p><b>massive</b> [3] - 61:23, 78:21, 125:3</p> <p><b>Masters</b> [1] - 8:9</p> <p><b>material</b> [5] - 10:8, 14:11, 14:12, 36:16, 119:24</p> <p><b>materials</b> [4] - 14:1, 14:3, 15:16, 53:12</p> <p><b>mathematical</b> [2] - 50:23, 51:6</p> <p><b>MATTER</b> [1] - 3:10</p> <p><b>matter</b> [8] - 12:2, 12:13, 24:21, 42:22, 43:24, 47:5, 55:18, 55:23</p> <p><b>matters</b> [3] - 24:17, 56:17, 109:5</p> <p><b>maximum</b> [10] - 29:2, 29:24, 77:2, 77:14, 77:17, 77:19, 113:18, 113:20, 114:3, 121:1</p> <p><b>MCL</b> [2] - 29:3, 29:20</p> <p><b>MCLG</b> [1] - 29:25</p> <p><b>MCLs</b> [3] - 29:4, 29:18, 39:25</p> <p><b>mean</b> [9] - 20:4, 42:15, 45:25, 58:2, 103:19, 107:21, 146:17, 146:18, 162:23</p> <p><b>meaning</b> [1] - 143:11</p> <p><b>means</b> [7] - 89:16, 95:12, 98:1, 126:10, 133:18, 134:1, 147:9</p> <p><b>meant</b> [1] - 162:25</p> <p><b>measure</b> [6] - 19:7, 19:20, 20:12, 42:19, 43:12, 58:3</p> <p><b>measured</b> [2] - 42:24, 43:22</p> <p><b>measurements</b> [4] - 19:9, 19:10, 65:15, 120:11</p> <p><b>measuring</b> [2] - 19:11, 50:10</p>	<p><b>media</b> [1] - 80:25</p> <p><b>medium</b> [4] - 88:5, 88:19, 89:7, 89:18</p> <p><b>mentioned</b> [16] - 20:23, 28:2, 31:21, 34:1, 39:10, 49:25, 63:20, 72:24, 82:8, 126:16, 141:7, 144:1, 144:22, 150:12, 170:1, 170:20</p> <p><b>mentions</b> [1] - 12:15</p> <p><b>menu</b> [3] - 99:2, 99:5, 99:11</p> <p><b>mergers</b> [1] - 9:11</p> <p><b>method</b> [1] - 11:21</p> <p><b>methodologies</b> [6] - 11:25, 12:3, 12:6, 24:21, 25:23, 102:22</p> <p><b>methodology</b> [9] - 24:20, 25:18, 26:11, 26:14, 27:3, 31:10, 73:21, 98:22, 113:12</p> <p><b>methyl</b> [1] - 28:3</p> <p><b>microbes</b> [1] - 37:21</p> <p><b>microorganisms</b> [1] - 60:16</p> <p><b>mid</b> [1] - 37:24</p> <p><b>middle</b> [1] - 107:5</p> <p><b>might</b> [33] - 14:8, 20:21, 27:13, 32:2, 32:11, 34:8, 44:8, 46:12, 46:13, 53:18, 54:4, 54:6, 54:25, 57:3, 57:5, 57:7, 59:24, 71:7, 98:5, 99:6, 112:25, 130:4, 134:3, 134:10, 134:11, 134:14, 135:20, 156:8, 156:22, 161:25, 165:2, 172:25, 173:10</p> <p><b>migrate</b> [4] - 38:18, 46:7, 49:5, 117:16</p> <p><b>migrated</b> [2] - 47:8, 78:19</p> <p><b>migrates</b> [1] - 116:21</p> <p><b>migrating</b> [1] - 125:4</p> <p><b>migration</b> [5] - 73:12, 79:2, 116:25, 124:14, 133:23</p> <p><b>mile</b> [5] - 66:12, 66:19, 72:1, 72:18, 112:2</p> <p><b>miles</b> [2] - 19:3, 20:24</p> <p><b>Miller</b> [7] - 4:10, 10:3, 108:20, 152:4, 170:2, 170:16, 176:6</p> <p><b>mILLER</b> [1] - 127:25</p>
	<p><b>M</b></p>		
	<p><b>magnitude</b> [3] - 31:23, 77:8, 77:9</p> <p><b>main</b> [3] - 66:9, 111:21, 157:21</p> <p><b>maintain</b> [1] - 103:5</p> <p><b>maintenance</b> [2] - 88:24, 89:8</p> <p><b>major</b> [1] - 16:2</p> <p><b>majority</b> [10] - 8:21, 11:13, 13:19, 14:16, 33:4, 36:6, 66:7, 68:1, 72:14, 134:8</p> <p><b>MANGES</b> [1] - 2:5</p> <p><b>Manges</b> [1] - 4:22</p> <p><b>manner</b> [1] - 147:20</p> <p><b>map</b> [6] - 64:16, 67:10, 67:12, 76:8, 107:6, 150:8</p>		

**MILLER** [46] - 1:15, 1:15, 4:9, 5:15, 5:19, 5:21, 6:6, 6:11, 6:19, 7:3, 7:12, 7:16, 10:12, 10:13, 10:19, 11:6, 36:8, 44:1, 45:4, 45:8, 48:3, 48:18, 48:19, 64:3, 64:7, 79:19, 79:21, 93:11, 96:6, 97:8, 97:15, 98:21, 100:24, 102:24, 106:6, 106:15, 106:18, 106:21, 108:21, 109:8, 109:23, 110:1, 115:3, 123:23, 158:25, 174:24

**millions** [4] - 35:9, 35:15, 70:4, 116:17

**mind** [4] - 45:4, 116:24, 157:3, 162:9

**minimum** [1] - 161:22

**minor** [1] - 23:12

**minute** [4] - 24:15, 32:6, 128:6, 151:18

**minutes** [3] - 174:2, 174:4, 174:10

**misrepresentation** [1] - 147:11

**missed** [1] - 128:2

**MIT** [2] - 8:17, 8:22

**mitigation** [1] - 29:11

**mix** [1] - 35:2

**mixed** [1] - 61:13

**mixing** [1] - 44:9

**MNA** [17] - 158:5, 158:17, 158:23, 159:13, 160:15, 160:19, 160:23, 161:14, 161:24, 167:15, 167:21, 168:13, 169:3, 169:5, 169:8, 169:9

**Mobil** [2] - 11:13, 54:9

**model** [4] - 41:20, 45:24, 46:19, 69:11

**moment** [2] - 165:20, 175:14

**money** [2] - 156:19, 173:18

**monitor** [10] - 19:7, 58:1, 58:2, 58:13, 74:19, 110:9, 131:3, 131:21, 151:6, 159:22

**monitored** [27] - 57:15, 57:17, 58:8, 58:21, 58:25, 59:7, 59:12, 59:17, 90:13, 91:17,

95:9, 100:25, 106:8, 121:20, 122:22, 151:11, 151:14, 152:14, 158:13, 158:16, 158:19, 159:10, 164:11, 166:2, 166:13, 167:21, 168:16

**Monitoring** [4] - 77:22, 114:7, 120:22, 152:25

**monitoring** [121] - 19:5, 26:22, 42:19, 42:22, 43:13, 47:2, 47:9, 48:10, 50:11, 58:4, 58:10, 58:12, 58:15, 65:12, 65:14, 66:13, 67:24, 68:17, 75:2, 77:19, 82:16, 82:17, 83:17, 83:21, 84:3, 84:14, 84:17, 91:24, 92:1, 94:9, 94:12, 94:24, 95:5, 95:11, 95:16, 95:24, 96:7, 99:6, 99:25, 100:1, 100:10, 100:11, 101:15, 103:24, 110:4, 110:6, 110:12, 110:14, 113:22, 113:24, 114:5, 115:4, 115:8, 120:24, 121:18, 122:11, 122:20, 122:25, 123:1, 123:5, 123:24, 124:1, 124:4, 125:21, 130:8, 130:24, 131:5, 131:10, 131:11, 131:16, 131:17, 131:18, 131:23, 132:1, 135:18, 136:3, 139:7, 141:25, 142:6, 142:12, 143:1, 150:9, 150:13, 150:15, 151:9, 151:23, 152:14, 153:13, 153:17, 154:14, 154:18, 155:4, 156:1, 156:19, 157:23, 157:24, 161:19, 162:8, 163:2, 163:14, 163:20, 163:22, 164:1, 164:2, 164:5, 164:15, 164:23, 164:24, 165:1, 165:13, 165:18, 165:21, 165:25, 166:1, 166:5, 166:13, 166:17, 166:23, 168:19, 168:20, 172:24

**MONTAGUE** [1] - 1:20

**Montague** [1] - 4:18

**months** [3] - 55:1, 139:18, 142:21

**Monty** [1] - 49:4

**moot** [2] - 134:24, 155:14

**morning** [17] - 4:8, 4:9, 4:20, 4:23, 5:1, 6:6, 7:17, 7:19, 12:4, 13:23, 17:2, 23:21, 45:19, 174:13, 174:14, 174:15, 175:10

**most** [28] - 20:19, 22:7, 22:12, 22:13, 22:14, 22:20, 22:21, 24:3, 29:9, 45:13, 48:22, 51:11, 60:7, 66:10, 77:17, 78:3, 78:6, 80:22, 101:8, 122:9, 124:20, 128:22, 129:1, 130:7, 135:5, 135:6, 150:12, 152:22

**motion** [7] - 57:12, 106:12, 107:16, 108:9, 108:15, 126:15, 154:11

**motions** [3] - 10:25, 160:9, 175:1

**Mount** [3] - 66:9, 71:1, 85:7

**move** [23] - 10:25, 13:6, 19:25, 21:15, 27:20, 35:25, 36:17, 37:1, 38:11, 41:16, 46:3, 46:6, 46:24, 47:4, 48:24, 55:2, 58:25, 62:14, 67:8, 106:19, 125:6, 148:4, 157:21

**moved** [1] - 16:9

**movement** [10] - 16:13, 35:23, 36:24, 38:12, 48:25, 50:19, 50:22, 57:21, 76:15, 119:20

**moves** [8] - 13:1, 18:8, 36:22, 38:19, 50:2, 50:6, 61:16

**moving** [8] - 14:19, 52:4, 82:23, 118:10, 119:14, 119:22, 119:24, 165:2

**MR** [101] - 4:9, 4:13, 4:18, 4:20, 4:23, 5:1, 5:15, 5:19, 5:21, 6:6, 6:11, 6:19, 7:3, 7:12, 7:16, 10:7, 10:12, 10:13, 10:19, 10:24, 11:2, 11:6, 36:8, 44:1, 45:4, 45:8, 47:18, 48:3, 48:18, 48:19, 64:3, 64:7, 79:10, 79:14, 79:19, 79:21, 93:11, 96:6, 97:8, 97:15,

98:21, 100:24, 102:24, 106:6, 106:11, 106:15, 106:18, 106:21, 107:10, 107:23, 108:21, 109:8, 109:19, 109:23, 110:1, 114:14, 114:17, 114:21, 115:3, 123:18, 123:23, 127:25, 128:5, 128:16, 129:11, 129:24, 138:7, 138:18, 138:19, 139:22, 140:3, 146:20, 146:23, 147:4, 147:7, 147:10, 147:22, 148:5, 148:11, 149:13, 149:21, 150:1, 152:9, 152:22, 156:6, 157:13, 157:18, 157:20, 158:25, 159:2, 159:7, 159:8, 161:12, 168:1, 168:10, 168:12, 174:1, 174:5, 174:21, 174:24, 174:25

**MS** [1] - 4:16

**MTBE** [124] - 9:15, 9:19, 9:21, 9:23, 10:1, 12:9, 12:16, 15:24, 16:13, 22:1, 22:7, 22:13, 22:25, 23:5, 23:9, 23:11, 23:14, 28:2, 28:8, 28:9, 28:12, 30:9, 34:14, 34:17, 35:4, 35:5, 35:8, 36:18, 37:11, 37:17, 38:6, 38:8, 38:10, 38:16, 39:8, 39:13, 39:17, 40:3, 40:12, 44:22, 47:4, 47:10, 48:11, 49:3, 49:21, 51:16, 52:7, 53:9, 54:3, 54:6, 55:5, 55:12, 59:15, 60:19, 61:3, 62:21, 63:1, 64:19, 64:23, 65:1, 65:15, 65:19, 65:21, 70:14, 70:19, 70:21, 70:24, 71:8, 71:23, 72:13, 72:15, 72:24, 73:6, 73:10, 77:3, 77:11, 77:19, 78:7, 80:19, 80:21, 81:12, 84:7, 84:15, 84:19, 84:20, 84:23, 85:3, 85:6, 85:13, 87:2, 87:7, 87:15, 96:9, 110:14, 112:8, 113:18, 114:3, 114:12, 115:18, 115:24, 116:1, 116:5, 116:13, 116:25, 118:9,

<p>119:14, 119:20, 123:9, 124:4, 124:11, 124:15, 125:15, 127:1, 132:23, 133:13, 135:19, 142:13, 153:1, 169:17, 170:2, 170:8</p> <p><b>MTBE's</b> [2] - 32:4, 114:9</p> <p><b>MTBEs</b> [1] - 114:19</p> <p><b>multi</b> [4] - 101:15, 102:10, 144:21, 144:23</p> <p><b>multi-level</b> [3] - 101:15, 144:21, 144:23</p> <p><b>multiphase</b> [4] - 44:10, 63:2, 117:23, 118:3</p> <p><b>multiphase's</b> [1] - 62:17</p> <p><b>multiple</b> [16] - 53:6, 56:8, 59:24, 63:23, 74:16, 74:18, 94:11, 101:17, 101:20, 102:5, 102:22, 103:15, 125:21, 144:3, 144:14, 146:3</p> <p><b>multiples</b> [1] - 43:16</p> <p><b>multiply</b> [1] - 100:14</p> <p><b>municipal</b> [6] - 9:25, 14:25, 26:4, 27:15, 34:6, 76:12</p> <p><b>must</b> [1] - 29:7</p> <p><b>MW-1</b> [1] - 120:22</p> <p><b>MW-5</b> [2] - 113:23, 120:24</p> <p><b>MY</b> [1] - 3:9</p>	<p>168:17, 168:20, 169:8, 169:9</p> <p><b>naturally</b> [2] - 22:2, 30:14</p> <p><b>nature</b> [6] - 61:3, 117:18, 118:17, 124:15, 133:17, 140:20</p> <p><b>near</b> [6] - 77:24, 90:18, 91:8, 150:14, 153:23, 163:10</p> <p><b>near-site</b> [1] - 90:18</p> <p><b>nearby</b> [1] - 34:3</p> <p><b>nearest</b> [2] - 71:9, 112:5</p> <p><b>nearly</b> [1] - 115:16</p> <p><b>necessarily</b> [2] - 8:11, 108:23</p> <p><b>necessary</b> [9] - 82:5, 132:14, 132:16, 134:3, 134:11, 137:13, 139:3, 148:2, 157:12</p> <p><b>need</b> [26] - 16:12, 32:17, 32:24, 73:19, 103:2, 109:12, 131:13, 138:4, 138:21, 139:7, 140:18, 140:20, 140:22, 142:7, 142:10, 143:1, 147:16, 151:14, 151:16, 156:3, 163:16, 172:18, 173:20, 174:3, 174:14, 174:16</p> <p><b>needed</b> [9] - 27:1, 95:5, 95:13, 133:8, 134:9, 151:22, 156:23, 157:2, 174:2</p> <p><b>needs</b> [9] - 32:10, 58:16, 91:11, 92:8, 97:11, 135:4, 140:24, 156:15, 167:19</p> <p><b>negative</b> [1] - 13:14</p> <p><b>net</b> [1] - 100:15</p> <p><b>network</b> [3] - 20:21, 52:9, 122:11</p> <p><b>never</b> [7] - 23:12, 113:6, 113:7, 139:11, 139:14, 146:10, 156:8</p> <p><b>NEW</b> [3] - 1:1, 1:4, 1:18</p> <p><b>new</b> [21] - 101:14, 104:9, 125:1, 126:17, 127:9, 127:11, 127:13, 127:16, 129:5, 135:9, 142:10, 142:12, 143:12, 148:15, 153:13, 154:14, 154:25, 155:4, 163:20, 164:5, 167:11</p>	<p><b>New</b> [24] - 4:10, 4:14, 4:17, 4:19, 13:22, 14:2, 14:13, 14:23, 28:15, 30:3, 30:10, 39:6, 39:23, 40:1, 45:17, 64:13, 64:16, 106:24, 107:6, 111:22, 129:10, 129:20, 156:25, 177:5</p> <p><b>next</b> [33] - 5:22, 12:14, 12:19, 13:25, 16:19, 24:15, 26:6, 27:23, 34:13, 39:3, 41:16, 41:20, 45:24, 48:20, 51:13, 52:18, 53:7, 54:3, 55:9, 57:12, 66:2, 77:5, 92:14, 96:25, 110:2, 111:5, 111:23, 112:11, 121:16, 123:11, 157:21, 157:23, 164:6</p> <p><b>NJ</b> [1] - 1:11</p> <p><b>NJDEP</b> [4] - 156:22, 176:11, 176:12, 176:12</p> <p><b>NO</b> [1] - 1:2</p> <p><b>non</b> [4] - 81:16, 112:18, 112:25, 170:8</p> <p><b>Non</b> [1] - 42:14</p> <p><b>Non-Aqueous</b> [1] - 42:14</p> <p><b>non-detect</b> [4] - 81:16, 112:18, 112:25, 170:8</p> <p><b>nondegradation</b> [1] - 30:2</p> <p><b>none</b> [1] - 121:24</p> <p><b>normal</b> [2] - 98:6, 105:1</p> <p><b>normally</b> [1] - 139:1</p> <p><b>north</b> [3] - 85:7, 153:7, 165:22</p> <p><b>northeast</b> [1] - 107:7</p> <p><b>northern</b> [1] - 152:22</p> <p><b>northwest</b> [7] - 67:19, 76:1, 76:4, 76:13, 76:15, 132:20</p> <p><b>notably</b> [1] - 22:14</p> <p><b>note</b> [1] - 114:2</p> <p><b>NOTES</b> [1] - 3:9</p> <p><b>nothing</b> [1] - 146:6</p> <p><b>notified</b> [1] - 97:9</p> <p><b>November</b> [1] - 128:18</p> <p><b>nowhere</b> [1] - 171:5</p> <p><b>NPV</b> [1] - 100:10</p> <p><b>number</b> [23] - 5:11, 36:12, 36:13, 36:15, 38:5, 56:9, 56:18, 60:2, 95:23, 101:9, 105:11,</p>	<p>107:11, 109:11, 114:5, 122:14, 122:20, 163:5, 163:25, 164:7, 167:2, 171:7, 171:18, 172:1</p> <p><b>numbered</b> [1] - 99:12</p> <p><b>numbers</b> [2] - 100:20, 146:1</p> <p><b>numerous</b> [3] - 11:19, 36:2, 145:15</p>
<b>O</b>			
			<p><b>objected</b> [2] - 147:4, 147:6</p> <p><b>objection</b> [9] - 10:4, 10:10, 10:22, 79:10, 79:13, 109:23, 114:14, 138:7, 158:25</p> <p><b>observed</b> [1] - 43:22</p> <p><b>obtain</b> [1] - 149:6</p> <p><b>obtained</b> [5] - 119:7, 148:14, 148:18, 149:4, 173:13</p> <p><b>obviously</b> [23] - 31:16, 44:5, 71:11, 78:19, 84:9, 98:2, 99:19, 103:7, 117:10, 122:7, 133:21, 133:24, 142:15, 147:1, 155:3, 156:14, 161:6, 164:20, 166:15, 166:19, 172:23, 173:16, 173:22</p> <p><b>occasion</b> [1] - 130:4</p> <p><b>occur</b> [12] - 35:12, 54:8, 54:19, 57:20, 63:11, 79:24, 89:6, 103:12, 118:20, 130:23, 169:6, 173:4</p> <p><b>occurred</b> [7] - 72:6, 72:15, 78:2, 86:13, 86:14, 103:14, 132:5</p> <p><b>occurrence</b> [1] - 114:9</p> <p><b>occurring</b> [5] - 30:14, 131:3, 131:22, 132:3</p> <p><b>occurs</b> [5] - 45:22, 60:11, 70:12, 131:11, 131:12</p> <p><b>octane</b> [3] - 22:16, 65:3, 65:7</p> <p><b>OF</b> [5] - 1:1, 1:4, 1:18, 1:18, 3:9</p> <p><b>off-site</b> [21] - 17:12, 56:20, 57:3, 78:22, 79:2, 80:2, 81:21, 81:25, 82:10, 82:11, 82:12, 83:14, 90:14, 92:6,</p>

<p>117:11, 118:16, 121:19, 122:2, 122:11, 133:10, 147:18</p> <p><b>off-the-record</b> [3] - 5:17, 64:6, 175:15</p> <p><b>offer</b> [1] - 10:19</p> <p><b>offered</b> [1] - 162:21</p> <p><b>Official</b> [1] - 177:3</p> <p><b>OFFICIAL</b> [2] - 1:25, 3:15</p> <p><b>offline</b> [1] - 29:12</p> <p><b>offset</b> [1] - 70:5</p> <p><b>often</b> [11] - 18:14, 35:1, 44:6, 45:21, 59:20, 59:24, 74:17, 81:7, 98:7, 101:24, 115:10</p> <p><b>oil</b> [10] - 9:7, 11:9, 11:11, 25:1, 25:11, 33:1, 35:1, 35:3, 36:11, 64:25</p> <p><b>Oil</b> [4] - 2:8, 2:11, 5:3, 11:13</p> <p><b>old</b> [2] - 35:1, 113:7</p> <p><b>OMM</b> [1] - 88:23</p> <p><b>on-and-off-site</b> [1] - 84:16</p> <p><b>on-site</b> [15] - 57:2, 79:3, 80:15, 82:2, 90:14, 90:18, 90:24, 93:15, 118:14, 124:18, 124:23, 158:3, 158:16, 159:25, 165:16</p> <p><b>once</b> [11] - 37:7, 37:11, 37:19, 57:19, 59:14, 64:1, 70:18, 83:18, 126:1, 146:10, 163:13</p> <p><b>one</b> [117] - 12:20, 12:25, 15:8, 15:9, 15:20, 16:6, 16:9, 16:15, 18:15, 19:18, 19:24, 20:12, 27:8, 30:5, 30:15, 31:16, 32:10, 32:25, 33:25, 34:23, 35:17, 37:23, 37:24, 38:17, 40:23, 40:24, 40:25, 41:16, 42:11, 46:18, 47:7, 49:11, 49:20, 51:2, 52:14, 53:2, 53:3, 53:5, 53:18, 54:4, 54:5, 54:10, 55:6, 55:18, 55:24, 55:25, 56:1, 56:5, 56:21, 56:22, 58:3, 58:16, 59:4, 59:14, 59:16, 59:23, 60:13, 60:19, 63:21, 71:3, 71:19, 72:22,</p>	<p>73:23, 75:5, 80:23, 82:20, 82:22, 84:25, 92:1, 97:4, 98:3, 98:8, 98:18, 99:6, 99:9, 99:19, 100:21, 101:21, 101:23, 101:24, 102:4, 102:12, 103:20, 104:7, 104:15, 109:8, 111:21, 112:2, 112:13, 112:20, 113:5, 117:13, 119:12, 121:19, 121:23, 123:11, 130:14, 131:2, 143:14, 144:2, 144:15, 148:2, 148:14, 148:19, 151:14, 151:18, 152:23, 153:15, 153:21, 155:9, 160:6, 169:19, 170:8, 172:24, 173:4, 175:13</p> <p><b>ones</b> [3] - 23:10, 146:23, 171:11</p> <p><b>ongoing</b> [16] - 92:1, 93:17, 93:19, 95:5, 117:20, 131:13, 131:14, 133:22, 133:25, 157:24, 158:20, 159:11, 164:2, 165:5, 165:18, 168:22</p> <p><b>onsite</b> [1] - 89:24</p> <p><b>open</b> [3] - 4:3, 93:3, 128:11</p> <p><b>operate</b> [2] - 165:16, 172:16</p> <p><b>operated</b> [1] - 81:15</p> <p><b>operating</b> [5] - 88:22, 88:23, 89:8, 107:9, 168:19</p> <p><b>operation</b> [4] - 88:24, 123:6, 158:20, 159:11</p> <p><b>operational</b> [1] - 41:9</p> <p><b>opining</b> [1] - 109:7</p> <p><b>opinion</b> [32] - 85:12, 86:9, 86:13, 86:15, 86:20, 86:23, 87:1, 87:11, 91:3, 91:19, 92:9, 105:21, 116:2, 116:24, 117:17, 119:23, 120:9, 124:12, 125:7, 125:9, 132:15, 135:17, 143:16, 157:21, 158:19, 159:5, 159:9, 160:15, 161:13, 161:17, 162:17, 169:1</p> <p><b>opinions</b> [29] - 11:5, 27:1, 32:16, 85:20, 86:3, 86:7, 109:4, 109:8,</p>	<p>109:15, 110:17, 116:8, 119:15, 127:15, 127:16, 127:19, 132:8, 132:10, 134:25, 135:16, 142:7, 142:11, 142:16, 155:1, 155:6, 156:18, 157:8, 157:11, 161:25</p> <p><b>opportunity</b> [1] - 174:20</p> <p><b>opposed</b> [1] - 90:14</p> <p><b>opposition</b> [3] - 108:9, 154:8, 154:10</p> <p><b>option</b> [1] - 137:24</p> <p><b>oral</b> [1] - 174:25</p> <p><b>order</b> [4] - 36:5, 95:23, 99:4, 173:17</p> <p><b>organic</b> [2] - 35:22, 81:10</p> <p><b>orientation</b> [3] - 15:20, 16:11, 20:15</p> <p><b>oriented</b> [1] - 16:7</p> <p><b>original</b> [7] - 16:22, 109:7, 124:9, 129:1, 130:6, 132:8, 132:18</p> <p><b>originally</b> [2] - 11:13, 22:15</p> <p><b>orphan</b> [1] - 126:9</p> <p><b>otherwise</b> [1] - 146:19</p> <p><b>ourselves</b> [1] - 92:8</p> <p><b>outerbounds</b> [1] - 141:10</p> <p><b>outside</b> [1] - 112:4</p> <p><b>outstanding</b> [1] - 94:3</p> <p><b>overall</b> [5] - 20:16, 24:16, 26:7, 125:15, 136:15</p> <p><b>overlying</b> [1] - 37:14</p> <p><b>overseeing</b> [1] - 139:18</p> <p><b>oversight</b> [2] - 130:3, 139:1</p> <p><b>own</b> [7] - 9:4, 17:17, 21:12, 33:3, 81:7, 99:16, 115:5</p> <p><b>ownership</b> [1] - 146:18</p> <p><b>owns</b> [1] - 96:1</p> <p><b>oxidation</b> [3] - 49:19, 63:6, 63:10</p> <p><b>oxidative</b> [1] - 63:16</p> <p><b>oxygen</b> [14] - 49:17, 49:18, 53:21, 53:23, 60:6, 60:9, 60:14, 60:16, 61:1, 61:6, 62:9, 63:8, 65:6</p> <p><b>oxygenate</b> [8] - 22:8, 22:11, 22:18, 28:5, 28:7,</p>	<p>34:20, 65:3, 118:1</p> <p><b>oxygenated</b> [2] - 22:21, 61:2</p> <p><b>oxygenates</b> [5] - 22:12, 22:13, 22:14, 115:21, 115:23</p>
<b>P</b>			
<p><b>p.m</b> [1] - 175:16</p> <p><b>package</b> [1] - 115:21</p> <p><b>page</b> [9] - 5:22, 6:24, 6:25, 7:10, 42:5, 92:14, 140:6, 140:7, 154:13</p> <p><b>pages</b> [1] - 72:6</p> <p><b>paid</b> [1] - 164:12</p> <p><b>pancake</b> [4] - 44:7, 44:8, 52:7</p> <p><b>paper</b> [4] - 171:17, 171:20, 172:5, 172:7</p> <p><b>papers</b> [3] - 10:6, 101:11, 106:7</p> <p><b>paragraph</b> [2] - 154:13, 160:10</p> <p><b>Parsons</b> [3] - 9:3, 9:6, 9:8</p> <p><b>part</b> [40] - 9:14, 16:11, 19:23, 25:18, 31:12, 31:14, 32:19, 33:5, 39:17, 44:10, 44:11, 46:19, 47:5, 55:12, 58:24, 73:20, 74:10, 76:17, 82:3, 83:5, 88:7, 95:9, 97:2, 100:3, 101:5, 106:12, 107:14, 111:20, 111:22, 111:25, 115:21, 116:3, 122:15, 126:15, 136:11, 140:15, 142:1, 143:5, 145:13, 147:19</p> <p><b>participating</b> [1] - 5:8</p> <p><b>particles</b> [3] - 35:22, 36:21, 43:5</p> <p><b>particular</b> [32] - 6:24, 7:10, 24:5, 24:20, 28:1, 28:25, 30:7, 32:4, 32:10, 33:15, 34:12, 35:4, 41:15, 47:7, 64:18, 65:11, 65:25, 66:25, 77:10, 77:11, 79:25, 82:22, 91:13, 96:11, 96:12, 99:3, 103:2, 116:20, 133:22, 154:23, 169:4, 172:3</p> <p><b>particularly</b> [14] - 8:1,</p>			

9:22, 35:20, 36:1, 37:15, 43:20, 46:4, 65:21, 72:7, 85:2, 104:3, 112:17, 116:14, 174:10  
**particulars** [1] - 68:11  
**parties** [5] - 5:12, 110:7, 110:9, 110:11, 177:12  
**partition** [4] - 37:12, 37:14, 61:15, 62:13  
**partly** [1] - 145:7  
**Partnership** [2] - 2:11, 5:3  
**parts** [22] - 35:9, 35:15, 39:18, 40:3, 54:10, 59:15, 77:20, 78:4, 78:8, 91:16, 101:4, 103:25, 112:23, 113:20, 114:4, 116:17, 116:23, 117:6, 120:16, 120:17, 123:8  
**party** [11] - 26:1, 26:2, 40:6, 40:9, 41:14, 45:2, 47:13, 48:12, 126:10, 129:21, 172:10  
**Passaic** [1] - 111:20  
**passes** [1] - 80:23  
**past** [3] - 8:23, 79:7, 84:10  
**pathway** [2] - 45:25, 46:7  
**Pause** [1] - 42:8  
**pay** [6] - 134:22, 137:14, 137:17, 142:18, 151:24, 164:14  
**paying** [2] - 157:6, 165:7  
**PC** [2] - 1:15, 2:7  
**PCE** [5] - 115:9, 115:11, 115:13, 115:18, 115:23  
**PEARLMAN** [1] - 1:16  
**penetrating** [1] - 52:4  
**penetrations** [1] - 130:19  
**people** [3] - 48:23, 51:10, 81:7  
**per** [25] - 35:9, 35:15, 39:17, 39:18, 40:3, 40:4, 54:10, 55:12, 59:15, 77:21, 78:4, 78:8, 100:13, 101:4, 101:5, 103:25, 112:23, 113:21, 114:4, 116:17, 116:23, 117:6, 120:16, 120:17, 123:8  
**perceived** [1] - 29:23  
**percent** [10] - 23:3, 29:10, 98:17, 100:20,

163:24, 170:25, 171:6, 171:18, 171:22, 172:1  
**percentage** [6] - 22:25, 98:15, 171:14, 171:21, 172:3, 172:4  
**percentages** [1] - 65:5  
**perchloroethylene** [1] - 115:10  
**perfectly** [1] - 105:1  
**perform** [1] - 95:5  
**performed** [9] - 17:19, 32:24, 96:21, 101:3, 132:12, 133:5, 137:17, 145:14, 172:10  
**performing** [3] - 16:3, 87:14, 98:2  
**perhaps** [5] - 5:10, 13:25, 16:1, 27:17, 120:6  
**period** [19] - 23:5, 54:23, 58:7, 70:19, 73:4, 89:6, 101:1, 105:7, 120:18, 124:22, 128:25, 130:6, 158:21, 158:23, 159:12, 159:13, 160:25, 166:23, 169:2  
**permeable** [1] - 61:22  
**permission** [1] - 106:16  
**permit** [5] - 167:7, 167:14, 167:20, 168:5, 170:23  
**permitted** [1] - 169:16  
**permitting** [2] - 89:4, 97:5  
**peroxide** [1] - 63:16  
**persist** [3] - 38:14, 101:4, 117:14  
**persistence** [1] - 38:21  
**persistent** [1] - 37:17  
**persisting** [1] - 38:21  
**persists** [1] - 38:20  
**person** [1] - 46:15  
**personally** [1] - 7:4  
**perspective** [1] - 111:8  
**pertinent** [2] - 17:7, 41:5  
**Phase** [1] - 42:14  
**phase** [2] - 61:21, 62:15  
**photograph** [1] - 66:4  
**phrase** [2] - 130:2, 159:6  
**physical** [4] - 62:12, 63:10, 63:17, 68:3  
**physically** [2] - 80:20, 88:15

**pick** [1] - 99:10  
**picture** [3] - 42:1, 52:13, 125:15  
**piece** [3] - 135:9, 148:15, 171:20  
**piling** [1] - 51:22  
**pipeline** [3] - 11:20, 16:2, 16:5  
**pipng** [1] - 33:13  
**pit** [2] - 52:2, 52:3  
**place** [5] - 53:20, 88:21, 123:1, 160:16, 177:8  
**placed** [2] - 83:17, 150:3  
**places** [3] - 143:14, 148:25, 173:9  
**plaintiff** [2] - 4:15, 6:2  
**Plaintiff's** [2] - 64:9, 106:21  
**plaintiffs** [1] - 107:24  
**Plaintiffs** [2] - 1:6, 1:21  
**plaintiffs'** [2] - 123:20, 154:10  
**plan** [3] - 94:25, 121:5, 121:17  
**planned** [1] - 160:13  
**planning** [3] - 30:23, 142:4, 174:22  
**plans** [2] - 154:14, 167:1  
**plant** [2] - 89:3, 89:4  
**plants** [1] - 23:10  
**Pleasant** [3] - 66:9, 71:1, 85:7  
**plotted** [1] - 113:10  
**plumage** [1] - 49:5  
**plumbing** [2] - 81:24, 89:2  
**plume** [17] - 16:6, 16:8, 34:8, 34:9, 48:22, 49:3, 49:5, 49:19, 49:21, 51:16, 63:22, 73:13, 116:18, 116:25, 119:20, 133:17, 141:11  
**plumes** [4] - 38:3, 38:6, 38:16, 48:24  
**plus** [1] - 20:7  
**point** [24] - 13:6, 19:21, 29:22, 31:2, 32:18, 36:2, 50:3, 50:4, 50:7, 56:18, 58:22, 58:24, 59:6, 59:10, 59:13, 69:2, 84:10, 84:16, 108:24, 109:14, 121:1, 157:10, 158:12, 158:15

**pointed** [1] - 108:7  
**points** [9] - 50:2, 83:3, 95:24, 101:15, 108:10, 125:17, 141:17, 157:15, 165:25  
**Points** [1] - 6:12  
**policy** [1] - 138:8  
**pollutants** [1] - 21:25  
**pollution** [1] - 27:11  
**pond** [1] - 112:6  
**poorly** [1] - 38:13  
**population** [1] - 22:21  
**pore** [4] - 13:2, 13:7, 14:15, 61:17  
**pores** [2] - 14:20, 15:3  
**porosity** [1] - 14:15  
**port** [1] - 102:10  
**portion** [1] - 52:10  
**ports** [6] - 101:20, 102:5, 102:6, 102:7, 102:23, 153:3  
**posed** [3] - 85:22, 86:4, 151:25  
**poses** [1] - 29:20  
**position** [5] - 9:8, 96:3, 142:19, 156:21, 158:1  
**positions** [1] - 8:23  
**possession** [1] - 123:20  
**possibility** [1] - 73:9  
**possible** [3] - 111:10, 134:16, 173:10  
**postgraduate** [1] - 8:7  
**potential** [4] - 27:6, 37:8, 86:17, 169:12  
**potentially** [3] - 31:24, 135:1, 169:10  
**Power** [1] - 6:12  
**PowerPoint** [5] - 64:10, 106:22, 108:21, 108:24, 149:23  
**PQL** [6] - 30:18, 39:16, 39:20, 40:19, 81:16, 112:25  
**practical** [5] - 21:20, 24:7, 24:13, 30:17, 39:16  
**pre** [19] - 17:15, 21:21, 21:22, 21:23, 24:4, 30:4, 30:8, 31:8, 39:12, 40:18, 95:7, 131:25, 141:23, 158:22, 159:13, 161:14, 162:11, 162:15, 162:24  
**pre-discharge** [19] -

<p>17:15, 21:21, 21:22, 21:23, 24:4, 30:4, 30:8, 31:8, 39:12, 40:18, 95:7, 131:25, 141:23, 158:22, 159:13, 161:14, 162:11, 162:15, 162:24</p> <p><b>precisely</b> [1] - 160:1</p> <p><b>predict</b> [8] - 15:23, 16:13, 46:15, 47:1, 47:15, 48:25, 51:1, 84:22</p> <p><b>predicted</b> [1] - 47:4</p> <p><b>predictions</b> [2] - 18:3, 34:15</p> <p><b>predominant</b> [1] - 75:4</p> <p><b>predominantly</b> [2] - 22:7, 75:16</p> <p><b>prefer</b> [5] - 60:16, 60:19, 60:24, 129:14, 174:13</p> <p><b>premarked</b> [1] - 6:7</p> <p><b>premier</b> [1] - 8:14</p> <p><b>premises</b> [1] - 114:22</p> <p><b>preparation</b> [8] - 93:18, 119:3, 119:8, 124:7, 126:22, 126:24, 134:7, 159:17</p> <p><b>prepare</b> [3] - 31:10, 126:19, 175:8</p> <p><b>prepared</b> [10] - 16:25, 23:22, 25:4, 30:19, 72:4, 72:8, 79:22, 126:20, 153:20, 171:11</p> <p><b>preparing</b> [2] - 98:18, 118:25</p> <p><b>present</b> [22] - 5:20, 12:18, 15:24, 22:2, 28:7, 31:17, 35:9, 42:17, 43:6, 46:6, 54:17, 62:1, 70:8, 73:7, 74:1, 85:10, 87:15, 87:19, 100:16, 122:3, 122:18</p> <p><b>presentation</b> [1] - 152:5</p> <p><b>presented</b> [4] - 105:19, 127:15, 132:8, 132:11</p> <p><b>press</b> [1] - 174:9</p> <p><b>pressure</b> [2] - 13:14, 20:7</p> <p><b>presumably</b> [2] - 137:20, 142:22</p> <p><b>pretty</b> [6] - 19:1, 37:3, 38:12, 68:7, 98:6, 98:11</p> <p><b>prevent</b> [1] - 118:9</p> <p><b>previous</b> [4] - 51:15,</p>	<p>53:20, 120:6, 127:14</p> <p><b>previously</b> [6] - 87:5, 87:24, 94:10, 117:15, 145:6, 145:7</p> <p><b>prices</b> [1] - 173:13</p> <p><b>primarily</b> [2] - 8:5, 22:4</p> <p><b>primary</b> [1] - 14:15</p> <p><b>prime</b> [1] - 67:18</p> <p><b>print</b> [1] - 152:21</p> <p><b>problem</b> [2] - 155:12, 155:16</p> <p><b>problems</b> [1] - 102:16</p> <p><b>procedures</b> [6] - 24:24, 25:2, 25:3, 25:7, 25:8, 121:8</p> <p><b>proceed</b> [3] - 6:5, 128:14, 158:5</p> <p><b>proceedings</b> [1] - 177:7</p> <p><b>process</b> [14] - 27:23, 29:13, 49:21, 58:22, 59:2, 62:8, 63:14, 81:17, 81:19, 93:14, 104:23, 105:2, 130:16, 168:22</p> <p><b>processes</b> [15] - 36:24, 57:20, 57:22, 57:23, 58:6, 58:17, 130:17, 131:1, 131:2, 131:7, 131:9, 131:13, 131:21, 161:7, 162:6</p> <p><b>Procter</b> [1] - 5:2</p> <p><b>PROCTER</b> [1] - 2:10</p> <p><b>produce</b> [1] - 19:6</p> <p><b>produces</b> [1] - 78:15</p> <p><b>product</b> [2] - 28:9, 54:21</p> <p><b>production</b> [1] - 80:10</p> <p><b>productive</b> [1] - 106:14</p> <p><b>products</b> [1] - 97:1</p> <p><b>profession</b> [2] - 7:18, 51:12</p> <p><b>professional</b> [3] - 99:16, 129:7, 129:20</p> <p><b>proffer</b> [1] - 10:9</p> <p><b>program</b> [30] - 30:23, 39:19, 40:8, 54:22, 55:8, 55:11, 58:25, 74:11, 80:13, 90:24, 91:15, 98:3, 124:23, 126:11, 126:13, 129:22, 136:8, 136:15, 139:9, 147:12, 154:23, 155:7, 157:25, 161:6, 162:10, 162:13, 162:18, 163:14, 171:4, 173:6</p>	<p><b>programs</b> [11] - 11:18, 11:22, 25:20, 30:20, 32:14, 32:17, 33:12, 33:13, 41:11, 45:2, 61:6</p> <p><b>project</b> [2] - 24:23, 54:9</p> <p><b>projected</b> [1] - 42:2</p> <p><b>projects</b> [4] - 9:19, 24:22, 53:4, 136:13</p> <p><b>promise</b> [1] - 151:19</p> <p><b>promised</b> [1] - 166:20</p> <p><b>promote</b> [3] - 49:18, 63:9, 63:17</p> <p><b>properties</b> [8] - 32:4, 34:14, 34:18, 38:5, 46:21, 96:4, 148:13, 148:17</p> <p><b>property</b> [6] - 96:1, 96:3, 113:22, 117:21, 148:15</p> <p><b>proposal</b> [2] - 95:10, 167:15</p> <p><b>propose</b> [1] - 141:3</p> <p><b>proposed</b> [13] - 11:22, 30:20, 93:22, 131:24, 132:13, 134:2, 143:7, 148:12, 153:22, 171:13, 172:22, 173:10, 173:11</p> <p><b>proposing</b> [10] - 95:17, 143:8, 143:11, 150:9, 150:13, 150:25, 153:6, 158:18, 163:6, 164:6</p> <p><b>PROTECTION</b> [2] - 1:5, 1:18</p> <p><b>Protection</b> [1] - 129:9</p> <p><b>provide</b> [3] - 104:22, 127:11, 171:5</p> <p><b>provided</b> [7] - 6:15, 9:20, 107:25, 108:1, 127:13, 142:21, 155:9</p> <p><b>providing</b> [1] - 10:16</p> <p><b>province</b> [2] - 136:8, 136:17</p> <p><b>proximate</b> [3] - 71:13, 71:18, 154:18</p> <p><b>proximity</b> [1] - 52:14</p> <p><b>public</b> [13] - 29:4, 29:6, 29:23, 66:15, 67:5, 67:19, 67:25, 76:20, 88:12, 112:1, 126:12, 148:16, 148:23</p> <p><b>Public</b> [6] - 68:15, 71:17, 87:20, 169:16, 170:3, 170:7</p> <p><b>publication</b> [1] - 99:14</p>	<p><b>publications</b> [1] - 99:13</p> <p><b>published</b> [1] - 49:2</p> <p><b>pull</b> [1] - 63:25</p> <p><b>pulling</b> [1] - 41:4</p> <p><b>pump</b> [38] - 21:2, 49:22, 56:3, 63:19, 63:20, 63:25, 65:8, 80:13, 89:8, 90:16, 90:17, 90:21, 90:24, 90:25, 91:8, 91:11, 91:14, 91:19, 102:8, 118:8, 118:14, 121:19, 121:21, 121:23, 122:1, 122:5, 122:9, 122:23, 122:24, 123:1, 123:6, 158:21, 159:11, 160:11, 165:6, 165:12, 165:16, 168:24</p> <p><b>pumped</b> [6] - 15:13, 21:9, 63:23, 64:1, 80:14, 82:1</p> <p><b>pumping</b> [11] - 18:12, 21:4, 21:9, 49:20, 56:10, 63:21, 63:24, 75:10, 89:2, 93:16, 118:16</p> <p><b>pumps</b> [2] - 73:3, 81:25</p> <p><b>pure</b> [8] - 42:16, 42:23, 43:6, 43:12, 45:3, 54:23, 61:21, 63:4</p> <p><b>purpose</b> [2] - 54:5, 135:24</p> <p><b>purposes</b> [1] - 102:25</p> <p><b>PURSUANT</b> [1] - 3:7</p> <p><b>purveyor</b> [1] - 29:7</p> <p><b>put</b> [15] - 6:25, 7:11, 48:17, 84:4, 88:20, 99:14, 109:2, 109:12, 109:17, 146:16, 149:14, 149:22, 152:4, 157:5, 174:12</p> <p><b>puts</b> [1] - 63:21</p> <p><b>Python</b> [1] - 49:4</p>
<b>Q</b>			
<p><b>qualification</b> [1] - 10:22</p> <p><b>qualifications</b> [3] - 10:4, 10:5, 12:13</p> <p><b>qualified</b> [1] - 10:9</p> <p><b>quality</b> [9] - 39:5, 40:2, 40:10, 59:14, 60:2, 136:19, 141:12, 141:15, 141:22</p> <p><b>quantitation</b> [2] - 30:17, 39:16</p>			

<p><b>quarterly</b> [1] - 123:2</p> <p><b>questioning</b> [3] - 4:8, 5:10, 115:1</p> <p><b>questions</b> [10] - 45:5, 85:22, 85:25, 86:2, 86:3, 108:22, 127:25, 138:8, 148:4, 170:15</p> <p><b>quicker</b> [1] - 59:21</p> <p><b>quickly</b> [1] - 37:20</p> <p><b>quite</b> [13] - 15:10, 29:16, 34:19, 53:25, 74:15, 82:12, 85:21, 90:2, 102:8, 103:14, 108:11, 132:10, 168:16</p> <p><b>quote</b> [1] - 159:2</p>	<p>122:19, 136:2, 144:8, 145:3, 161:18, 172:20</p> <p><b>reasonable</b> [8] - 58:7, 105:25, 110:18, 142:19, 149:11, 160:19, 164:8, 167:9</p> <p><b>reasonably</b> [3] - 38:2, 69:15, 116:24</p> <p><b>reasons</b> [1] - 121:23</p> <p><b>receive</b> [1] - 126:24</p> <p><b>received</b> [4] - 99:12, 119:9, 126:23, 155:11</p> <p><b>recent</b> [11] - 70:20, 77:17, 78:3, 78:6, 104:12, 105:7, 112:17, 128:22, 129:1, 130:7, 150:5</p> <p><b>recently</b> [1] - 47:6</p> <p><b>receptor</b> [3] - 27:7, 27:8, 27:12</p> <p><b>receptors</b> [11] - 27:6, 34:4, 34:5, 46:8, 71:9, 86:18, 111:24, 112:9, 170:14, 170:17</p> <p><b>recess</b> [2] - 92:13, 128:9</p> <p><b>recharge</b> [2] - 18:9, 18:14</p> <p><b>recharge/discharge</b> [1] - 18:25</p> <p><b>recharges</b> [1] - 27:19</p> <p><b>recharging</b> [1] - 18:9</p> <p><b>recollection</b> [4] - 154:6, 154:17, 160:5, 160:11</p> <p><b>recommend</b> [8] - 32:20, 32:23, 84:3, 94:9, 100:25, 104:20, 144:8, 169:11</p> <p><b>recommendation</b> [8] - 84:8, 91:9, 96:7, 106:8, 121:18, 156:22, 163:15, 165:24</p> <p><b>recommendations</b> [25] - 55:5, 56:14, 73:15, 73:18, 79:5, 79:8, 79:11, 79:23, 80:6, 80:9, 82:6, 85:17, 91:6, 94:2, 94:6, 96:12, 96:16, 96:18, 96:23, 123:12, 134:9, 154:24, 155:19, 156:13, 169:19</p> <p><b>recommended</b> [31] - 58:21, 58:24, 79:25, 80:4, 82:10, 82:15, 83:5,</p>	<p>83:7, 83:16, 84:6, 84:19, 93:24, 94:22, 122:5, 122:19, 122:22, 132:19, 132:21, 134:20, 145:3, 145:6, 145:7, 145:10, 145:11, 154:21, 156:1, 156:5, 166:17, 169:12, 169:15</p> <p><b>recommending</b> [11] - 81:21, 82:9, 82:11, 101:16, 121:23, 123:4, 134:17, 168:25, 171:4, 172:9, 172:15</p> <p><b>record</b> [11] - 5:16, 5:17, 6:8, 7:5, 64:5, 64:6, 77:16, 104:16, 174:18, 175:14, 175:15</p> <p><b>records</b> [2] - 33:10, 33:11</p> <p><b>recover</b> [5] - 45:3, 62:25, 156:25, 164:21, 173:22</p> <p><b>recovering</b> [1] - 158:8</p> <p><b>recovery</b> [2] - 54:21, 56:10</p> <p><b>Recross</b> [1] - 176:3</p> <p><b>red</b> [5] - 51:19, 51:22, 52:12, 52:15, 67:12</p> <p><b>Redirect</b> [1] - 176:3</p> <p><b>reduce</b> [3] - 59:5, 62:5, 96:22</p> <p><b>reduced</b> [2] - 130:18, 171:13</p> <p><b>reducing</b> [2] - 92:3, 162:14</p> <p><b>reduction</b> [1] - 162:7</p> <p><b>refer</b> [8] - 12:23, 14:4, 17:24, 30:2, 40:2, 50:8, 136:13, 153:10</p> <p><b>reference</b> [2] - 20:5, 154:13</p> <p><b>referenced</b> [1] - 108:2</p> <p><b>referred</b> [19] - 13:5, 13:9, 14:14, 18:8, 21:5, 29:2, 29:24, 39:15, 50:14, 57:24, 62:2, 69:3, 69:7, 69:22, 70:6, 74:17, 88:6, 107:12, 111:20</p> <p><b>referring</b> [3] - 6:24, 10:24, 49:17</p> <p><b>refineries</b> [2] - 11:20, 22:21</p> <p><b>reflect</b> [1] - 94:2</p> <p><b>reformulated</b> [4] - 22:8,</p>	<p>22:9, 22:22, 23:1</p> <p><b>refresh</b> [3] - 154:6, 154:17, 160:5</p> <p><b>refreshes</b> [1] - 160:10</p> <p><b>regard</b> [4] - 48:9, 91:11, 110:16, 148:8</p> <p><b>regarding</b> [1] - 140:5</p> <p><b>region</b> [1] - 34:11</p> <p><b>regional</b> [12] - 17:9, 17:23, 17:25, 18:2, 18:17, 19:14, 33:19, 33:23, 70:10, 111:6, 111:25</p> <p><b>regionally</b> [1] - 70:11</p> <p><b>regs</b> [2] - 168:2</p> <p><b>regulates</b> [1] - 28:11</p> <p><b>regulations</b> [2] - 28:14, 141:8</p> <p><b>regulatory</b> [3] - 28:20, 139:4, 140:16</p> <p><b>reject</b> [2] - 87:11, 143:1</p> <p><b>relate</b> [3] - 13:22, 107:14, 116:8</p> <p><b>related</b> [7] - 9:23, 13:20, 19:17, 77:20, 82:13, 97:25, 173:23</p> <p><b>relates</b> [2] - 12:13, 163:25</p> <p><b>relation</b> [1] - 133:24</p> <p><b>relationship</b> [3] - 18:13, 18:25, 109:15</p> <p><b>relative</b> [4] - 88:18, 125:16, 177:10, 177:13</p> <p><b>relatively</b> [3] - 61:21, 78:1, 104:9</p> <p><b>release</b> [35] - 16:4, 21:24, 23:14, 25:21, 25:25, 33:2, 33:11, 34:21, 43:3, 43:9, 43:11, 44:16, 45:22, 49:6, 50:6, 51:16, 51:18, 62:23, 73:22, 78:2, 82:13, 86:9, 86:10, 86:25, 103:23, 110:8, 110:10, 115:9, 116:11, 116:15, 116:16, 117:4, 121:1, 129:22, 133:22</p> <p><b>released</b> [7] - 31:24, 34:24, 35:6, 45:10, 46:5, 60:23, 71:23</p> <p><b>releases</b> [5] - 11:20, 22:6, 23:9, 38:6, 115:14</p> <p><b>relevant</b> [1] - 156:16</p>
<b>R</b>			
<p><b>raised</b> [2] - 65:7, 109:4</p> <p><b>raising</b> [1] - 157:9</p> <p><b>ran</b> [3] - 9:9, 72:5, 81:24</p> <p><b>Range</b> [1] - 139:24</p> <p><b>ranged</b> [1] - 68:25</p> <p><b>rate</b> [8] - 37:20, 38:12, 38:15, 56:10, 63:24, 131:12, 131:14, 131:20</p> <p><b>rated</b> [2] - 89:9, 89:18</p> <p><b>rates</b> [2] - 160:22, 161:21</p> <p><b>rather</b> [4] - 14:19, 52:6, 145:5, 168:4</p> <p><b>reaccumulate</b> [1] - 55:3</p> <p><b>reaccumulated</b> [1] - 55:1</p> <p><b>reach</b> [4] - 29:10, 32:16, 49:8, 135:4</p> <p><b>reached</b> [7] - 26:14, 46:17, 47:2, 59:14, 158:3, 158:7, 160:12</p> <p><b>reaction</b> [2] - 63:11, 63:17</p> <p><b>read</b> [4] - 10:6, 68:11, 136:24, 142:22</p> <p><b>readily</b> [1] - 36:16</p> <p><b>ready</b> [1] - 175:6</p> <p><b>reagent</b> [1] - 63:17</p> <p><b>real</b> [6] - 17:10, 52:25, 71:19, 104:2, 109:14, 114:19</p> <p><b>realize</b> [2] - 54:24, 78:14</p> <p><b>realized</b> [2] - 38:1, 69:19</p> <p><b>really</b> [8] - 5:13, 52:6, 57:11, 90:7, 90:8, 105:24, 124:25, 174:13</p> <p><b>reason</b> [10] - 94:17, 103:5, 115:8, 122:5,</p>			

<p><b>reliable</b> [1] - 104:17  <b>relied</b> [1] - 130:12  <b>rely</b> [2] - 58:11, 159:20  <b>relying</b> [3] - 58:9, 61:14, 126:12  <b>remaining</b> [2] - 32:22, 91:16  <b>remedial</b> [10] - 72:14, 136:14, 136:15, 138:13, 140:8, 167:6, 167:20, 173:5  <b>remediate</b> [2] - 53:16, 72:10  <b>remediated</b> [1] - 80:3  <b>remediation</b> [64] - 11:18, 25:15, 25:20, 31:3, 31:5, 39:19, 40:8, 41:7, 41:11, 49:11, 56:23, 59:11, 59:16, 59:21, 72:7, 72:17, 78:11, 78:14, 79:4, 80:12, 80:16, 89:24, 91:15, 117:12, 117:18, 117:20, 118:18, 121:5, 122:2, 124:18, 124:23, 126:11, 129:7, 129:22, 132:5, 132:19, 133:8, 133:10, 133:17, 133:25, 135:20, 136:7, 136:11, 137:8, 137:10, 139:19, 140:13, 142:1, 142:20, 158:3, 158:9, 158:12, 159:19, 162:10, 162:13, 162:18, 167:4, 167:10, 167:14, 168:18, 168:24, 171:12, 172:9, 172:15  <b>remember</b> [4] - 71:3, 71:4, 95:22, 144:10  <b>removal</b> [1] - 33:12  <b>remove</b> [4] - 49:14, 61:23, 80:21, 81:11  <b>removed</b> [4] - 100:22, 124:20, 156:4, 173:24  <b>removing</b> [1] - 72:20  <b>rendered</b> [1] - 26:24  <b>rephrase</b> [1] - 129:15  <b>replace</b> [1] - 102:18  <b>replaced</b> [1] - 44:20  <b>replacement</b> [1] - 33:13  <b>reply</b> [2] - 108:7, 108:11  <b>report</b> [100] - 6:16, 6:20, 66:6, 68:12, 71:16, 77:18, 78:4, 79:5, 79:15,</p>	<p>79:22, 80:10, 82:7, 82:24, 93:19, 93:20, 94:7, 94:8, 96:13, 96:16, 96:17, 96:18, 97:2, 107:15, 107:19, 107:22, 107:24, 108:3, 108:13, 108:14, 108:18, 109:6, 109:7, 110:23, 114:8, 118:8, 118:25, 119:3, 119:4, 119:8, 121:14, 123:21, 124:3, 124:7, 124:9, 124:10, 126:19, 126:20, 126:23, 126:25, 128:17, 128:19, 128:22, 129:1, 130:5, 130:7, 132:6, 132:8, 132:14, 132:18, 133:14, 134:3, 134:7, 134:18, 135:9, 135:10, 139:20, 140:9, 140:14, 140:18, 140:24, 141:3, 142:2, 142:5, 142:21, 143:2, 143:24, 145:5, 149:17, 149:22, 150:6, 152:4, 152:11, 153:6, 153:21, 154:21, 156:2, 158:2, 159:17, 164:10, 167:4, 167:6, 167:10, 169:15, 169:20, 171:5, 171:16, 172:6  <b>Reporter</b> [2] - 177:4  <b>REPORTER</b> [2] - 1:25, 3:15  <b>reports</b> [15] - 6:8, 7:4, 7:7, 25:5, 26:25, 30:19, 33:1, 33:14, 105:18, 115:22, 118:23, 119:16, 130:3, 169:11, 171:25  <b>represent</b> [4] - 51:20, 66:4, 103:9, 141:18  <b>request</b> [2] - 119:6, 126:21  <b>require</b> [6] - 137:14, 138:1, 141:25, 143:2, 143:16, 151:23  <b>required</b> [15] - 22:18, 46:13, 91:16, 92:5, 92:6, 96:22, 134:21, 135:20, 137:5, 137:8, 139:19, 140:15, 165:21, 166:1, 167:5  <b>requires</b> [2] - 157:5, 173:6  <b>requiring</b> [2] - 164:11,</p>	<p>164:23  <b>research</b> [1] - 8:21  <b>residence</b> [1] - 27:14  <b>residences</b> [1] - 34:7  <b>residual</b> [1] - 59:8  <b>resource</b> [2] - 30:7, 31:6  <b>resources</b> [3] - 9:24, 30:6, 32:25  <b>respect</b> [12] - 42:2, 55:17, 60:19, 65:25, 90:22, 91:13, 121:6, 133:23, 135:20, 141:21, 167:1, 167:24  <b>response</b> [8] - 22:17, 22:22, 75:9, 106:10, 126:15, 132:11, 170:1, 170:15  <b>responses</b> [1] - 48:5  <b>responsible</b> [12] - 26:2, 40:6, 40:9, 41:14, 45:2, 47:13, 48:12, 110:7, 126:10, 129:9, 129:21, 172:10  <b>rest</b> [1] - 97:10  <b>restoration</b> [30] - 10:18, 25:15, 30:6, 31:4, 31:7, 32:17, 39:12, 40:15, 55:8, 55:10, 55:15, 55:22, 56:14, 56:23, 58:25, 59:5, 59:17, 59:25, 91:15, 91:20, 94:5, 94:25, 95:7, 97:1, 98:3, 121:17, 123:10, 123:12, 138:14, 155:6  <b>restore</b> [10] - 17:14, 21:20, 23:17, 23:25, 24:4, 40:18, 53:16, 55:19, 58:18, 162:19  <b>restoring</b> [1] - 58:6  <b>restricted</b> [1] - 36:24  <b>result</b> [5] - 79:7, 130:21, 131:7, 132:13, 162:6  <b>resulted</b> [1] - 132:7  <b>results</b> [3] - 102:10, 115:18, 127:10  <b>resumed</b> [1] - 93:8  <b>retained</b> [3] - 16:21, 33:1, 68:1  <b>retard</b> [1] - 57:21  <b>retarded</b> [2] - 35:23, 38:13  <b>reveal</b> [1] - 134:14  <b>review</b> [14] - 17:7, 17:8,</p>	<p>26:19, 31:14, 33:8, 33:25, 107:20, 107:21, 107:22, 113:13, 155:3, 163:13, 165:14, 166:19  <b>reviewed</b> [10] - 25:5, 33:5, 66:1, 72:3, 105:17, 106:24, 113:10, 115:25, 141:8, 159:16  <b>reviewing</b> [2] - 127:19, 139:5  <b>revised</b> [4] - 128:19, 140:9, 145:4, 158:2  <b>revisit</b> [1] - 142:7  <b>rich</b> [1] - 60:14  <b>rid</b> [1] - 62:24  <b>Ridgewood</b> [2] - 112:12, 112:22  <b>rigorous</b> [1] - 104:22  <b>rise</b> [4] - 4:4, 93:4, 128:8, 128:12  <b>risk</b> [9] - 27:20, 28:23, 28:25, 29:18, 29:20, 29:21, 29:23, 31:7, 104:25  <b>risk-base</b> [1] - 29:18  <b>risk-based</b> [2] - 28:23, 31:7  <b>risks</b> [1] - 88:12  <b>river</b> [1] - 113:7  <b>rivers</b> [1] - 53:13  <b>road</b> [2] - 20:20, 20:22  <b>rock</b> [18] - 13:3, 14:7, 14:13, 14:17, 14:21, 14:23, 15:5, 15:15, 15:19, 15:25, 20:9, 53:2, 53:10, 53:25, 54:13, 54:16, 68:5, 68:6  <b>roughly</b> [1] - 22:25  <b>rule</b> [1] - 73:9  <b>run</b> [6] - 39:1, 101:7, 101:10, 134:12, 135:13, 161:7  <b>runs</b> [2] - 67:18, 68:14  <b>RUSSONIELLO</b> [2] - 1:24, 3:15  <b>Russoniello</b> [4] - 3:14, 177:3, 177:19, 177:20</p>
<b>S</b>			
<p><b>S/Vincent</b> [2] - 3:14, 177:19  <b>Saddle</b> [1] - 4:14  <b>sample</b> [15] - 77:17,</p>			

77:21, 101:20, 102:5,  
102:22, 103:3, 103:8,  
104:24, 113:6, 144:3,  
144:14, 153:3, 153:14,  
157:22

**sampled** [5] - 77:13,  
120:24, 126:1, 153:1,  
170:7

**samples** [19] - 26:22,  
58:4, 65:18, 68:5, 69:10,  
78:8, 87:6, 103:6,  
115:17, 116:3, 116:6,  
119:5, 120:19, 126:17,  
127:9, 144:6, 151:16,  
151:17, 154:20

**sampling** [11] - 65:17,  
70:20, 78:6, 83:3, 94:18,  
104:22, 126:4, 141:17,  
144:23, 150:21, 163:22

**sand** [3] - 14:7, 51:17,  
111:15

**sands** [2] - 14:5, 14:9

**saturated** [5] - 13:4,  
13:8, 13:13, 13:17,  
50:15

**scale** [1] - 38:22

**scenario** [1] - 157:3

**scenarios** [1] - 101:7

**science** [4] - 7:20, 8:6,  
8:15, 19:22

**Science** [1] - 8:9

**scientific** [1] - 7:22

**scope** [3] - 96:23,  
171:11, 172:14

**screen** [2] - 6:25, 149:14

**screened** [4] - 74:14,  
82:18, 94:23, 163:7

**seal** [2] - 102:7, 102:8

**season** [2] - 75:8, 75:9

**seated** [1] - 4:6

**second** [11] - 26:20,  
27:13, 28:3, 32:1, 44:12,  
62:12, 71:5, 75:15,  
88:13, 92:5, 160:8

**secondarily** [1] - 36:20

**secondary** [3] - 62:2,  
62:5, 72:21

**section** [5] - 67:17, 68:8,  
68:14, 70:14, 120:7

**SECTION** [1] - 3:7

**sections** [4] - 64:10,  
67:14, 67:15, 67:22

**sector** [1] - 9:10

**sediment** [1] - 52:8

**sediments** [11] - 14:5,  
15:3, 15:5, 50:15, 51:17,  
52:24, 67:4, 68:25,  
74:14, 75:3, 111:13

**see** [35] - 6:19, 12:24,  
14:2, 14:8, 14:12, 41:13,  
52:6, 52:21, 60:19,  
64:15, 66:7, 68:19,  
70:12, 91:24, 101:24,  
104:7, 107:6, 108:22,  
113:1, 135:16, 140:6,  
140:7, 140:11, 142:10,  
147:23, 152:24, 154:6,  
160:5, 160:10, 160:13,  
165:9, 165:18, 171:25,  
175:10, 175:13

**seeing** [1] - 117:5

**seek** [1] - 167:6

**seeking** [10] - 106:12,  
133:9, 135:23, 157:22,  
163:20, 170:16, 170:19,  
170:21, 172:20, 173:22

**seem** [1] - 164:8

**select** [1] - 59:18

**selected** [2] - 121:12,  
150:23

**selecting** [1] - 56:16

**selection** [1] - 121:15

**self** [2] - 42:10, 57:16

**self-evident** [1] - 42:10

**self-explanatory** [1] -  
57:16

**semi** [1] - 123:2

**semi-annual** [1] - 123:2

**send** [1] - 6:22

**sentiments** [1] - 67:1

**separate** [2] - 115:25,  
143:17

**separation** [1] - 103:5

**series** [3] - 40:24, 71:12,  
99:14

**service** [12] - 11:16,  
11:19, 49:6, 66:6, 71:3,  
83:11, 99:3, 106:19,  
107:5, 112:7, 124:16,  
162:18

**services** [1] - 99:16

**set** [14] - 5:18, 65:16,  
70:9, 85:22, 85:25,  
96:12, 110:16, 110:19,  
124:4, 125:23, 126:2,  
126:19, 140:18, 177:8

**sets** [2] - 17:23, 141:10  
**setting** [11] - 17:25, 20:8,  
21:19, 27:5, 30:23,  
33:23, 34:11, 39:4,  
51:14, 55:23, 111:7

**settings** [4] - 13:22,  
13:24, 45:17, 54:14

**settlements** [2] - 54:8,  
54:12

**seven** [2] - 88:3, 160:23

**several** [4] - 20:24, 47:6,  
85:4, 94:17

**shake** [1] - 147:8

**shaking** [1] - 147:23

**shallow** [5] - 103:1,  
103:17, 103:21, 104:8,  
120:3

**shallowest** [2] - 68:19,  
69:6

**sheet** [3] - 171:17, 172:5,  
172:7

**Shell** [1] - 16:3

**shells** [1] - 81:2

**shift** [1] - 64:3

**shoes** [1] - 130:1

**short** [3] - 89:6, 158:21,  
159:12

**shorter** [1] - 160:24

**show** [8] - 49:23, 67:14,  
72:8, 76:8, 107:3,  
152:20, 168:2, 172:2

**showed** [1] - 51:15

**showing** [1] - 52:13

**shown** [3] - 51:19, 66:3,  
68:9

**shows** [11] - 49:3, 49:17,  
51:18, 64:16, 68:15,  
70:9, 112:11, 120:7,  
150:8, 152:13, 171:25

**shut** [2] - 158:15, 160:14

**side** [6] - 87:18, 132:22,  
132:24, 156:7, 169:22,  
170:16

**signed** [1] - 5:5

**significant** [7] - 38:6,  
43:11, 122:14, 122:17,  
125:1, 125:23, 132:7

**significantly** [1] - 124:22

**silts** [2] - 14:6, 111:16

**similar** [12] - 22:6, 26:13,  
45:20, 49:13, 52:11,  
52:19, 57:6, 81:5, 91:3,  
127:5, 144:13, 145:15

**simple** [2] - 19:17,  
111:10

**simply** [6] - 65:3, 121:4,  
125:4, 127:13, 132:2,  
155:21

**single** [12] - 23:4, 27:14,  
74:16, 86:4, 101:19,  
102:5, 102:23, 103:4,  
103:10, 105:12, 144:14,  
170:8

**sit** [5] - 34:8, 154:5,  
155:18, 160:3, 167:25

**site** [266] - 12:8, 17:9,  
17:12, 17:25, 18:3, 19:4,  
19:13, 24:1, 24:2, 24:5,  
25:10, 26:21, 27:5,  
31:11, 31:15, 31:18,  
33:2, 33:5, 33:9, 33:15,  
34:12, 38:25, 40:7,  
40:25, 41:3, 41:6, 41:9,  
41:12, 41:15, 41:20,  
43:23, 44:17, 46:16,  
46:19, 46:25, 47:7,  
47:19, 47:24, 47:25,  
48:7, 48:12, 48:13,  
48:15, 48:16, 55:8,  
55:25, 56:1, 56:9, 56:11,  
56:13, 56:17, 56:20,  
57:2, 57:3, 62:22, 62:23,  
64:8, 64:12, 64:18,  
65:25, 66:8, 66:10,  
66:11, 66:13, 66:20,  
66:22, 66:25, 67:18,  
68:13, 68:14, 68:15,  
68:22, 68:24, 70:23,  
71:10, 71:14, 71:17,  
71:23, 72:2, 72:4, 72:7,  
72:10, 72:17, 73:16,  
73:23, 74:4, 76:10,  
76:11, 76:13, 76:25,  
77:4, 77:13, 77:20,  
78:13, 78:14, 78:17,  
78:19, 78:22, 79:2, 79:3,  
79:24, 80:2, 80:5, 80:12,  
80:15, 81:21, 81:24,  
81:25, 82:2, 82:10,  
82:11, 82:12, 83:14,  
84:6, 84:16, 86:1, 86:4,  
86:6, 86:10, 86:16,  
87:23, 89:22, 90:12,  
90:14, 90:18, 90:22,  
90:24, 91:1, 91:6, 91:8,  
91:9, 91:10, 91:14,

91:16, 91:23, 92:6,  
93:15, 94:5, 94:25, 95:4,  
95:17, 96:8, 96:11,  
96:23, 97:1, 98:16,  
99:10, 104:3, 105:6,  
106:20, 106:25, 107:4,  
107:7, 110:3, 110:5,  
110:18, 111:2, 111:11,  
113:9, 113:13, 113:15,  
113:19, 113:22, 114:13,  
115:5, 116:10, 116:12,  
117:2, 117:4, 117:11,  
117:16, 118:6, 118:7,  
118:10, 118:14, 118:16,  
119:5, 119:18, 119:21,  
120:15, 120:21, 121:13,  
121:15, 121:17, 121:19,  
121:25, 122:2, 122:4,  
122:10, 122:11, 122:18,  
123:10, 123:13, 124:1,  
124:18, 124:19, 124:21,  
124:23, 125:6, 125:14,  
126:9, 128:18, 129:2,  
129:6, 129:23, 130:9,  
130:13, 130:15, 131:19,  
131:24, 132:6, 132:20,  
133:2, 133:10, 133:13,  
133:18, 133:19, 133:21,  
133:23, 134:13, 135:5,  
136:16, 136:22, 137:1,  
137:2, 137:13, 137:21,  
138:5, 138:21, 139:19,  
140:5, 140:19, 142:24,  
143:20, 144:17, 146:22,  
146:24, 147:18, 151:22,  
152:16, 152:22, 156:10,  
158:3, 158:16, 159:25,  
162:1, 162:18, 163:3,  
165:16, 168:14, 168:20,  
169:4, 169:5, 171:15,  
172:3, 172:11, 172:12,  
172:13, 172:19, 174:18  
**site-specific** [19] - 17:9,  
24:1, 31:11, 31:15, 33:5,  
33:9, 38:25, 40:25, 41:3,  
55:8, 55:25, 56:11,  
56:13, 73:23, 86:6,  
90:12, 113:13, 121:15,  
172:13  
**sites** [58] - 5:11, 11:19,  
11:23, 12:1, 16:23, 17:8,  
17:10, 17:12, 21:19,  
23:20, 23:24, 24:2, 25:1,

25:16, 25:20, 25:21,  
25:24, 25:25, 30:20,  
32:13, 32:22, 35:12,  
35:14, 42:21, 43:14,  
43:15, 43:16, 43:20,  
43:21, 44:25, 45:14,  
47:6, 47:23, 48:5, 55:5,  
56:4, 56:8, 58:20, 58:23,  
59:9, 59:20, 60:1, 64:4,  
73:22, 85:23, 85:24,  
86:5, 115:14, 115:16,  
121:11, 123:16, 129:10,  
131:6, 139:5, 145:16,  
171:8, 172:8, 172:18  
**sits** [1] - 62:2  
**sitting** [3] - 45:21,  
159:24, 166:21  
**situ** [6] - 53:18, 53:20,  
53:22, 62:6, 62:8, 63:6  
**situation** [7] - 42:18,  
54:15, 96:20, 97:10,  
108:23, 124:25, 135:6  
**six** [10] - 94:9, 94:24,  
95:10, 95:12, 95:17,  
96:7, 136:1, 148:12,  
153:2, 153:3  
**size** [2] - 56:5, 65:24  
**skip** [1] - 94:5  
**skipped** [1] - 119:12  
**slices** [1] - 67:14  
**slide** [35] - 12:14, 12:19,  
13:25, 14:9, 16:19,  
24:15, 26:6, 34:13, 39:3,  
48:20, 51:13, 51:15,  
51:17, 53:20, 55:9,  
57:12, 57:14, 66:2, 67:9,  
70:9, 71:25, 76:24,  
77:10, 96:25, 107:3,  
108:6, 110:2, 111:5,  
111:23, 112:11, 119:11,  
120:6, 121:16  
**slides** [4] - 12:11, 67:8,  
107:11, 108:4  
**slightly** [7] - 20:15,  
61:13, 127:6, 153:7,  
158:23, 159:14, 161:15  
**slim** [1] - 98:11  
**slope** [7] - 49:24, 50:18,  
50:20, 50:25, 69:20,  
70:6, 70:7  
**slower** [1] - 161:8  
**slowly** [1] - 57:22  
**small** [5] - 13:12, 17:18,

97:22, 102:8, 152:21  
**soil** [24] - 8:6, 13:3,  
35:18, 35:19, 35:21,  
35:23, 36:16, 36:21,  
43:5, 56:19, 61:7, 61:9,  
61:19, 61:20, 61:21,  
61:22, 62:1, 62:4, 62:16,  
62:18, 68:5, 89:21,  
89:24, 90:8  
**sold** [1] - 9:5  
**solid** [1] - 14:13  
**soluble** [3] - 35:4, 35:8,  
36:20  
**solvent** [2] - 115:11,  
115:16  
**solvents** [3] - 37:16,  
60:23  
**someone** [1] - 18:19  
**sometimes** [1] - 45:8  
**somewhat** [4] - 57:6,  
77:24, 83:6, 146:4  
**somewhere** [1] - 101:7  
**sorry** [2] - 29:17, 119:12  
**sort** [2] - 44:7, 98:9  
**sought** [1] - 107:23  
**sound** [1] - 167:9  
**sounds** [4] - 158:6,  
160:4, 162:21, 170:13  
**source** [14] - 23:13, 62:2,  
62:5, 70:24, 72:20,  
72:21, 78:20, 78:23,  
79:3, 85:13, 85:18, 87:2,  
87:4, 87:12  
**sources** [4] - 22:6, 23:9,  
42:11, 141:1  
**south** [13] - 85:6, 111:19,  
112:7, 116:21, 119:18,  
119:22, 119:25, 120:4,  
120:5, 122:3, 122:18,  
125:4  
**south-southeast** [2] -  
120:4, 120:5  
**south-southwest** [1] -  
120:4  
**southeast** [2] - 120:4,  
120:5  
**southwest** [8] - 66:21,  
75:5, 75:11, 75:17,  
75:22, 76:11, 120:1,  
120:4  
**space** [2] - 14:15, 61:17  
**spaces** [2] - 13:2, 13:7  
**sparging** [3] - 62:7, 62:8,

117:24  
**speaking** [1] - 43:19  
**specific** [34] - 17:9, 18:3,  
24:1, 31:11, 31:15, 33:5,  
33:9, 38:25, 40:25, 41:3,  
55:8, 55:25, 56:9, 56:11,  
56:13, 73:23, 74:20,  
82:18, 82:19, 83:3, 83:4,  
84:21, 85:25, 86:6,  
90:12, 96:10, 113:13,  
121:15, 135:15, 144:6,  
167:8, 167:23, 167:24,  
172:13  
**specifically** [8] - 24:14,  
63:22, 82:20, 96:8,  
99:10, 121:11, 144:11,  
162:13  
**speculate** [2] - 135:1,  
155:17  
**speculation** [1] - 114:17  
**speed** [2] - 37:1, 51:1  
**spend** [2] - 88:20, 174:14  
**spending** [1] - 57:10  
**spent** [2] - 9:14, 9:16  
**spill** [1] - 16:2  
**spoken** [1] - 139:14  
**spot** [1] - 155:1  
**spread** [1] - 104:19  
**spreading** [1] - 44:5  
**staff** [2] - 17:18, 17:19  
**stand** [1] - 156:14  
**standard** [19] - 29:10,  
29:18, 29:22, 30:3, 30:4,  
39:11, 39:22, 39:24,  
55:20, 59:15, 60:3,  
73:20, 98:22, 113:12,  
115:21, 141:15, 141:22,  
141:23  
**standards** [8] - 29:8,  
31:7, 39:5, 40:1, 40:2,  
40:10, 136:19, 141:12  
**standing** [1] - 20:17  
**stands** [1] - 42:13  
**star** [3] - 64:17, 71:16,  
107:4  
**start** [2] - 21:22, 81:12  
**started** [1] - 9:4  
**starting** [3] - 9:17, 108:6,  
169:1  
**starts** [2] - 21:2, 168:23  
**STATE** [2] - 1:11, 1:18  
**State** [15] - 4:10, 4:17,  
4:19, 14:2, 30:5, 64:16,

<p>107:6, 129:7, 129:13, 129:20, 156:18, 156:25, 157:1, 157:3, 177:5</p> <p><b>state</b> [5] - 21:23, 26:3, 29:9, 107:7, 141:5</p> <p><b>State's</b> [2] - 30:5, 140:15</p> <p><b>statement</b> [1] - 118:21</p> <p><b>states</b> [2] - 9:23, 30:1</p> <p><b>States</b> [3] - 8:18, 22:24, 177:3</p> <p><b>STATES</b> [2] - 1:1, 1:10</p> <p><b>station</b> [52] - 11:19, 25:1, 33:11, 33:13, 47:3, 49:6, 51:24, 64:19, 66:6, 69:6, 69:19, 70:15, 70:25, 71:4, 71:5, 75:15, 77:22, 77:24, 80:14, 80:17, 81:18, 82:13, 83:11, 83:18, 84:17, 85:13, 86:22, 87:1, 87:7, 87:20, 99:4, 106:20, 106:23, 107:5, 107:9, 110:8, 110:10, 110:13, 112:7, 113:25, 116:12, 116:15, 116:16, 117:1, 117:19, 118:12, 118:14, 118:18, 122:12, 124:16, 125:15</p> <p><b>stations</b> [6] - 11:16, 22:5, 45:15, 55:17, 71:3, 71:6</p> <p><b>stature</b> [1] - 8:13</p> <p><b>steeper</b> [2] - 50:18, 50:21</p> <p><b>STENOGRAPHIC</b> [1] - 3:9</p> <p><b>stenographically</b> [1] - 177:7</p> <p><b>Step</b> [2] - 33:19, 113:13</p> <p><b>step</b> [10] - 27:23, 31:9, 31:21, 40:20, 41:4, 57:9, 77:5, 80:18, 113:7, 175:9</p> <p><b>steps</b> [5] - 40:25, 55:10, 73:23, 130:1, 134:2</p> <p><b>stick</b> [1] - 35:18</p> <p><b>still</b> [21] - 32:17, 37:8, 43:6, 53:24, 62:1, 92:5, 92:8, 93:19, 95:12, 122:16, 131:11, 131:13, 134:9, 146:4, 156:14, 156:15, 156:16, 157:2, 159:5, 159:9, 173:15</p> <p><b>Stop</b> [1] - 71:20</p> <p><b>stop</b> [1] - 106:15</p> <p><b>stopped</b> [2] - 44:19,</p>	<p>159:19</p> <p><b>stops</b> [1] - 123:6</p> <p><b>storage</b> [7] - 33:12, 45:11, 45:14, 51:21, 52:1, 77:25, 114:22</p> <p><b>Store</b> [1] - 71:21</p> <p><b>store</b> [1] - 66:21</p> <p><b>straight</b> [2] - 20:19, 45:23</p> <p><b>strata</b> [4] - 69:4, 70:13, 74:1, 74:12</p> <p><b>strategic</b> [1] - 9:12</p> <p><b>stream</b> [4] - 27:18, 49:9, 49:24, 50:4</p> <p><b>streams</b> [2] - 34:3, 53:13</p> <p><b>STREET</b> [1] - 1:11</p> <p><b>strip</b> [2] - 62:13, 118:2</p> <p><b>structured</b> [1] - 36:14</p> <p><b>students</b> [1] - 8:19</p> <p><b>studies</b> [1] - 38:1</p> <p><b>study</b> [5] - 7:23, 87:22, 121:7, 121:10, 121:13</p> <p><b>subject</b> [6] - 9:15, 42:22, 45:1, 47:23, 48:6, 55:18</p> <p><b>submission</b> [1] - 109:6</p> <p><b>submit</b> [4] - 130:3, 140:15, 168:2, 175:5</p> <p><b>submitted</b> [4] - 108:8, 115:17, 154:7, 154:10</p> <p><b>subsequent</b> [5] - 73:13, 96:22, 126:24, 133:4, 134:7</p> <p><b>subsequently</b> [1] - 120:23</p> <p><b>subset</b> [3] - 16:25, 55:14, 76:24</p> <p><b>substance</b> [1] - 10:11</p> <p><b>substeps</b> [1] - 40:24</p> <p><b>subsurface</b> [26] - 13:1, 13:2, 15:15, 15:24, 16:13, 36:22, 38:9, 42:17, 42:24, 43:7, 44:21, 45:11, 46:17, 49:15, 53:22, 60:11, 61:24, 63:18, 67:10, 67:15, 68:4, 70:3, 74:6, 74:24, 82:21, 151:7</p> <p><b>subvertical</b> [1] - 14:18</p> <p><b>suck</b> [2] - 61:17, 118:3</p> <p><b>sucked</b> [1] - 54:23</p> <p><b>sufficient</b> [3] - 58:18, 95:6, 110:16</p> <p><b>suggest</b> [1] - 109:19</p>	<p><b>suggested</b> [2] - 16:5, 144:8</p> <p><b>suggesting</b> [1] - 91:10</p> <p><b>suggestion</b> [1] - 174:6</p> <p><b>summarize</b> [3] - 33:8, 77:9, 107:8</p> <p><b>summarized</b> [2] - 106:25, 113:16</p> <p><b>summarizing</b> [1] - 119:17</p> <p><b>summary</b> [4] - 31:11, 94:6, 113:15, 120:14</p> <p><b>summation</b> [2] - 106:1, 168:6</p> <p><b>supervision</b> [2] - 129:8, 147:21</p> <p><b>supplement</b> [3] - 107:18, 108:18, 158:14</p> <p><b>supplemental</b> [3] - 107:15, 124:10, 153:20</p> <p><b>supplementing</b> [1] - 108:12</p> <p><b>supplied</b> [2] - 18:12, 56:8</p> <p><b>supplies</b> [1] - 10:1</p> <p><b>Supply</b> [13] - 66:18, 68:15, 70:21, 71:8, 71:12, 71:17, 71:19, 72:16, 85:5, 87:20, 169:16, 170:3, 170:7</p> <p><b>supply</b> [20] - 15:1, 19:1, 27:13, 29:7, 34:5, 34:6, 50:5, 66:15, 66:17, 67:5, 67:19, 67:25, 71:13, 71:18, 75:18, 76:12, 76:20, 83:15, 111:22, 112:2</p> <p><b>support</b> [3] - 87:11, 108:9, 154:10</p> <p><b>supported</b> [1] - 127:14</p> <p><b>surface</b> [19] - 7:23, 7:24, 12:24, 16:17, 18:12, 19:9, 21:13, 27:17, 27:19, 27:21, 34:2, 44:6, 45:16, 49:8, 50:12, 50:13, 50:21, 111:12, 112:5</p> <p><b>surprised</b> [1] - 173:12</p> <p><b>suspected</b> [1] - 141:1</p> <p><b>SVE</b> [1] - 90:6</p> <p><b>sVE</b> [1] - 90:7</p> <p><b>sworn</b> [1] - 6:2</p> <p><b>syrup</b> [2] - 44:7, 52:7</p>	<p><b>system</b> [48] - 80:15, 81:15, 81:23, 82:2, 88:21, 89:1, 89:24, 91:14, 93:17, 97:5, 99:8, 101:25, 103:4, 103:14, 118:9, 118:15, 121:19, 121:24, 122:6, 123:6, 132:21, 133:10, 143:21, 143:25, 144:1, 144:10, 144:12, 144:21, 145:5, 145:17, 145:21, 145:24, 146:7, 146:11, 146:22, 147:18, 152:19, 153:1, 158:10, 158:16, 159:25, 160:14, 165:17, 168:18, 169:15, 172:17, 173:25</p> <p><b>systems</b> [1] - 102:2</p>
<b>T</b>			
<p><b>table</b> [7] - 49:23, 50:8, 50:14, 50:15, 50:20, 62:10, 88:1</p> <p><b>tact</b> [1] - 108:17</p> <p><b>tailored</b> [1] - 96:8</p> <p><b>tank</b> [13] - 33:12, 44:19, 44:20, 45:11, 45:12, 45:13, 45:21, 51:21, 51:24, 52:1, 52:2, 52:3, 81:4</p> <p><b>tanks</b> [3] - 45:14, 77:25, 114:22</p> <p><b>tap</b> [1] - 81:8</p> <p><b>target</b> [3] - 31:2, 39:20, 40:19</p> <p><b>targeting</b> [1] - 40:10</p> <p><b>targets</b> [1] - 39:4</p> <p><b>TBA</b> [9] - 28:4, 28:5, 30:9, 39:9, 39:17, 39:18, 40:4, 77:12, 110:14</p> <p><b>Tec</b> [1] - 8:17</p> <p><b>technical</b> [4] - 17:14, 31:19, 48:22, 88:14</p> <p><b>technique</b> [1] - 11:21</p> <p><b>techniques</b> [1] - 123:11</p> <p><b>technologies</b> [22] - 17:14, 21:20, 23:17, 23:24, 24:6, 40:16, 40:17, 53:22, 55:19, 55:21, 56:2, 57:13, 87:25, 88:4, 88:8, 89:7, 89:18, 89:21, 90:11, 117:25, 121:12, 121:15</p> <p><b>technology</b> [29] - 24:3,</p>			

24:13, 53:18, 53:19,  
55:25, 56:7, 56:12,  
56:17, 56:22, 56:25,  
57:4, 57:5, 60:4, 61:10,  
62:4, 62:6, 63:7, 63:19,  
64:2, 80:22, 89:1, 89:12,  
90:21, 91:3, 104:19,  
122:9, 144:16, 145:22,  
145:23  
**ten** [1] - 54:9  
**tends** [1] - 60:17  
**tens** [4] - 54:10, 103:25,  
104:1, 117:5  
**term** [9] - 17:16, 20:4,  
37:10, 41:23, 48:22,  
50:8, 88:18, 88:21,  
129:5  
**termed** [1] - 112:3  
**terminals** [1] - 11:19  
**terminology** [1] - 13:15  
**terms** [19] - 12:3, 12:20,  
13:15, 17:20, 19:17,  
26:16, 30:25, 31:20,  
39:22, 41:9, 42:9, 65:23,  
88:20, 89:19, 91:2,  
111:1, 122:17, 127:8,  
143:7  
**tertiary** [2] - 28:3, 28:4  
**test** [1] - 84:23  
**tested** [1] - 115:17  
**testified** [1] - 6:2  
**testify** [4] - 45:18,  
129:14, 134:2, 134:4  
**testifying** [3] - 17:1,  
107:19, 114:23  
**testimony** [11] - 10:11,  
10:16, 50:1, 107:13,  
108:5, 109:16, 130:12,  
144:10, 162:22, 171:16,  
171:19  
**Texaco** [1] - 71:4  
**text** [1] - 72:5  
**THE** [140] - 1:1, 1:12,  
3:7, 3:9, 4:4, 4:5, 4:12,  
5:4, 5:16, 5:18, 5:20,  
6:5, 6:10, 6:14, 6:22,  
7:9, 7:13, 10:2, 10:8,  
10:21, 11:1, 11:3, 42:5,  
43:19, 43:21, 45:6,  
47:20, 48:1, 48:4, 48:15,  
48:17, 64:5, 79:13,  
79:18, 88:23, 88:24,  
91:7, 91:13, 91:19,

91:21, 91:23, 91:25,  
92:7, 92:12, 93:4, 93:5,  
95:14, 95:16, 95:19,  
95:21, 95:25, 96:2,  
97:13, 97:16, 97:17,  
97:21, 97:24, 98:1, 98:2,  
98:14, 98:16, 98:20,  
99:18, 99:22, 99:24,  
100:1, 100:3, 100:5,  
100:7, 100:8, 100:13,  
100:15, 100:17, 100:18,  
100:23, 102:13, 102:14,  
102:19, 102:21, 104:2,  
104:3, 105:9, 105:11,  
105:15, 105:17, 105:21,  
105:25, 106:2, 106:3,  
106:5, 106:17, 107:21,  
108:20, 109:3, 109:16,  
109:21, 109:25, 114:15,  
114:18, 114:23, 123:22,  
128:3, 128:7, 128:8,  
128:12, 128:13, 129:14,  
129:19, 138:11, 146:16,  
146:21, 147:1, 147:6,  
147:8, 147:13, 147:23,  
148:9, 149:20, 149:24,  
152:20, 152:24, 155:20,  
155:24, 157:8, 157:15,  
159:1, 159:4, 161:1,  
161:3, 161:4, 161:6,  
161:9, 161:11, 168:4,  
174:3, 174:6, 174:22,  
175:2, 175:11, 175:13  
**therefore** [31] - 15:9,  
15:12, 16:8, 17:11, 30:6,  
35:23, 36:16, 38:2, 43:6,  
44:25, 52:20, 56:23,  
62:4, 82:15, 84:11,  
86:13, 89:15, 94:1,  
101:8, 102:8, 107:12,  
117:13, 119:6, 126:12,  
133:7, 149:5, 156:14,  
160:24, 165:10, 172:17,  
173:2  
**they've** [3] - 104:14,  
143:24, 166:1  
**thick** [1] - 69:1  
**thickness** [1] - 6:20  
**thin** [2] - 66:25, 67:1  
**thinks** [2] - 138:17,  
157:12  
**third** [10] - 27:17, 31:9,  
40:20, 60:4, 66:12,

66:19, 72:1, 88:18,  
140:7, 169:14  
**thousand** [3] - 83:25,  
97:6, 117:6  
**thousands** [2] - 54:10,  
104:1  
**threat** [2] - 86:16, 87:1  
**threatened** [1] - 27:16  
**three** [7] - 24:10, 27:9,  
52:14, 64:10, 77:11,  
88:9, 151:7  
**throughout** [3] - 15:4,  
22:23, 118:7  
**throw** [1] - 51:1  
**timeframe** [2] - 125:25,  
160:19  
**timeline** [2] - 113:11,  
113:17  
**timing** [1] - 139:23  
**tipped** [1] - 70:5  
**TITLE** [1] - 3:7  
**TO** [2] - 3:7, 3:8  
**today** [22] - 5:6, 6:18,  
13:16, 13:20, 16:25,  
36:9, 47:23, 48:2, 48:6,  
54:16, 57:10, 94:4,  
105:21, 127:19, 154:5,  
157:16, 159:5, 159:9,  
159:24, 160:3, 166:21,  
174:9  
**today's** [2] - 47:24, 78:3  
**together** [3] - 24:12,  
41:4, 53:1  
**tomorrow** [6] - 174:13,  
174:19, 174:23, 175:4,  
175:8, 175:10  
**tonight** [1] - 175:8  
**took** [5] - 26:8, 101:8,  
123:15, 125:19, 160:24  
**tool** [1] - 41:21  
**top** [11] - 20:18, 34:8,  
44:3, 44:6, 44:7, 51:20,  
52:7, 61:12, 99:25,  
100:19, 170:25  
**topography** [2] - 19:18,  
34:1  
**total** [9] - 17:1, 97:19,  
99:23, 100:3, 100:5,  
100:9, 100:20, 109:10,  
109:11  
**toward** [7] - 21:16,  
49:24, 59:3, 59:4, 68:20,  
119:20, 125:6

**towards** [5] - 19:3, 50:2,  
50:7, 75:18, 83:14  
**township** [1] - 64:12  
**track** [1] - 104:16  
**trademarked** [1] - 106:4  
**TRANSCRIPT** [1] - 3:8  
**transcript** [1] - 177:6  
**TRANSCRIPTION** [1] -  
3:9  
**transfer** [1] - 35:5  
**transition** [4] - 13:11,  
13:12, 59:10, 59:16  
**transport** [5] - 31:19,  
32:3, 42:3, 46:4, 46:20  
**transportations** [1] -  
162:7  
**treat** [36] - 49:22, 56:3,  
61:10, 63:19, 63:20,  
64:1, 80:20, 90:9, 90:16,  
90:17, 90:21, 90:24,  
90:25, 91:8, 91:11,  
91:14, 91:19, 118:8,  
118:15, 121:19, 121:21,  
121:24, 122:1, 122:6,  
122:9, 122:23, 122:24,  
123:1, 123:6, 158:21,  
159:11, 160:11, 165:6,  
165:12, 165:16, 168:24  
**treated** [2] - 56:11,  
165:12  
**treatment** [18] - 29:12,  
46:13, 80:15, 81:13,  
81:17, 81:22, 81:23,  
82:4, 82:9, 89:1, 89:3,  
89:4, 89:9, 93:17, 97:5,  
97:25, 99:8, 173:24  
**tree** [1] - 12:25  
**TRENTON** [1] - 1:11  
**trial** [5] - 17:8, 17:10,  
134:4, 134:10, 135:12  
**tried** [1] - 96:2  
**tries** [2] - 33:25, 41:25  
**trivial** [1] - 109:10  
**true** [6] - 24:25, 35:11,  
133:21, 142:9, 168:16,  
177:6  
**truncated** [1] - 5:13  
**truth** [1] - 145:3  
**try** [4] - 45:2, 46:18,  
79:19, 111:9  
**trying** [5] - 17:21, 40:6,  
128:1, 156:25, 174:9  
**TULLY** [14] - 2:10, 5:1,

<p>10:7, 11:2, 106:11, 107:10, 107:23, 109:19, 114:14, 114:17, 114:21, 123:18, 174:5, 174:25 <b>Tully</b> [1] - 5:2 <b>turn</b> [15] - 12:11, 16:19, 33:19, 39:3, 40:20, 54:4, 64:8, 76:24, 85:20, 87:22, 119:11, 120:13, 140:7, 160:9, 166:23 <b>turned</b> [3] - 159:25, 160:11, 165:6 <b>Turnpike</b> [1] - 106:24 <b>twice</b> [4] - 113:8, 126:1, 142:18, 157:6 <b>two</b> [42] - 8:17, 13:11, 14:3, 15:14, 15:16, 17:1, 17:22, 18:22, 23:20, 26:18, 27:24, 28:1, 28:15, 28:21, 39:11, 40:7, 44:4, 54:2, 54:9, 54:17, 60:11, 60:17, 62:10, 64:4, 66:17, 67:12, 71:2, 71:6, 80:6, 91:25, 93:16, 95:22, 100:19, 102:21, 112:2, 112:20, 120:17, 120:19, 139:18, 142:21, 151:7, 170:14 <b>Tyler</b> [1] - 4:18 <b>TYLER</b> [1] - 1:20 <b>type</b> [9] - 14:12, 14:22, 17:21, 25:17, 33:16, 57:7, 64:2, 68:16, 171:4 <b>types</b> [12] - 14:3, 15:14, 17:22, 25:22, 26:18, 33:7, 33:21, 39:11, 40:21, 60:12, 101:23, 136:13 <b>typical</b> [6] - 14:1, 31:13, 33:24, 40:5, 49:3, 99:15 <b>typically</b> [2] - 40:7, 59:9</p>	<p>98:13, 171:3, 173:7 <b>uncertainty</b> [1] - 98:5 <b>unchanged</b> [1] - 127:7 <b>uncommon</b> [1] - 115:18 <b>unconfined</b> [1] - 20:6 <b>unconsolidated</b> [20] - 14:4, 15:3, 15:16, 51:16, 52:8, 52:24, 53:12, 53:17, 53:24, 54:7, 54:12, 66:23, 67:1, 67:4, 68:25, 74:13, 75:3, 75:10, 111:13, 119:24 <b>under</b> [11] - 12:17, 13:14, 17:19, 87:25, 88:8, 98:10, 129:2, 129:8, 136:8, 147:19, 147:20 <b>undergraduate</b> [1] - 8:3 <b>underground</b> [8] - 33:12, 45:11, 45:14, 51:21, 51:24, 52:1, 77:25, 114:21 <b>underlying</b> [1] - 109:3 <b>understandable</b> [1] - 111:10 <b>understood</b> [4] - 84:9, 164:9, 165:14, 165:17 <b>undertaken</b> [1] - 155:21 <b>unfortunately</b> [2] - 103:13, 135:6 <b>Unfortunately</b> [1] - 35:2 <b>unimpeded</b> [1] - 125:6 <b>United</b> [4] - 8:4, 8:18, 22:23, 177:3 <b>UNITED</b> [2] - 1:1, 1:10 <b>units</b> [2] - 111:15 <b>universities</b> [2] - 8:12, 8:20 <b>university</b> [1] - 8:15 <b>unless</b> [3] - 136:21, 137:2, 137:22 <b>unnecessary</b> [1] - 156:9 <b>unrelated</b> [1] - 23:8 <b>unretarded</b> [1] - 36:23 <b>unsaturated</b> [2] - 13:5, 61:8 <b>up</b> [48] - 6:22, 7:11, 9:17, 11:22, 23:16, 30:21, 40:6, 42:7, 51:23, 53:9, 53:19, 54:3, 54:24, 56:24, 57:1, 57:2, 57:4, 78:23, 81:2, 81:3, 81:18, 85:6, 89:5, 93:14, 98:23,</p>	<p>100:21, 105:7, 110:23, 118:7, 120:16, 120:18, 129:2, 129:10, 130:13, 131:5, 131:19, 133:12, 138:12, 149:14, 152:4, 159:1, 159:16, 170:17, 171:6, 171:17, 171:18, 172:1, 172:2 <b>up-front</b> [1] - 89:5 <b>update</b> [1] - 167:11 <b>updated</b> [4] - 93:18, 94:1, 119:1, 126:20 <b>updating</b> [1] - 135:8 <b>urban</b> [1] - 16:16 <b>USDJ</b> [1] - 1:12 <b>useful</b> [2] - 18:2, 18:4 <b>USEPA</b> [1] - 98:18 <b>uses</b> [2] - 23:12, 46:7 <b>UST</b> [1] - 51:21 <b>utilities</b> [1] - 29:10 <b>utilized</b> [2] - 89:24, 147:18</p>	<p><b>veneer</b> [1] - 67:1 <b>version</b> [1] - 96:15 <b>versus</b> [8] - 15:15, 20:6, 31:4, 56:19, 101:1, 101:12, 102:10, 138:14 <b>vertical</b> [2] - 14:18, 67:14 <b>vessels</b> [1] - 80:24 <b>vicinity</b> [3] - 21:4, 107:4, 154:15 <b>view</b> [1] - 97:10 <b>VINCENT</b> [2] - 1:24, 3:15 <b>Vincent</b> [2] - 177:3, 177:20 <b>voids</b> [1] - 13:2 <b>volatile</b> [2] - 61:21, 115:22 <b>volatility</b> [1] - 61:14 <b>volatilize</b> [3] - 37:5, 37:9, 37:12 <b>VOLUME</b> [1] - 1:6 <b>volume</b> [2] - 23:3, 44:20 <b>voluntarily</b> [1] - 137:22</p>
<b>U</b>		<b>V</b>	<b>W</b>
<p><b>U.K.</b> [1] - 8:15 <b>U.S</b> [2] - 1:25, 3:15 <b>U.S.C</b> [1] - 3:7 <b>ultimate</b> [2] - 98:5, 98:7 <b>ultimately</b> [9] - 63:12, 72:23, 73:13, 95:6, 151:21, 158:22, 159:12, 161:13, 162:15 <b>uncertainties</b> [4] - 98:12,</p>		<p><b>vadose</b> [12] - 12:21, 13:6, 13:17, 50:17, 56:19, 56:24, 61:8, 61:11, 62:15, 62:24, 89:23, 118:4 <b>valid</b> [2] - 102:10, 103:9 <b>validity</b> [1] - 157:11 <b>valuable</b> [1] - 16:16 <b>value</b> [2] - 22:16, 100:16 <b>vapor</b> [14] - 37:14, 61:7, 61:15, 61:16, 61:22, 62:4, 62:15, 62:16, 62:18, 63:2, 63:4, 89:21, 89:24, 90:8 <b>vapors</b> [1] - 34:9 <b>variable</b> [1] - 14:21 <b>variation</b> [3] - 75:6, 113:4, 120:1 <b>varied</b> [1] - 23:2 <b>varies</b> [3] - 64:25, 95:21, 120:4 <b>variety</b> [2] - 11:11, 101:18 <b>various</b> [8] - 6:17, 9:23, 51:19, 65:15, 74:11, 99:9, 101:6, 160:22 <b>vary</b> [5] - 36:12, 45:15, 56:23, 74:24, 86:5 <b>velocity</b> [2] - 50:22, 51:8</p>	<p><b>Waldwick</b> [5] - 48:8, 48:13, 106:24, 117:1, 122:10 <b>wants</b> [1] - 82:20 <b>water</b> [83] - 7:23, 10:1, 13:4, 13:8, 13:13, 14:16, 14:18, 14:20, 15:1, 15:4, 15:6, 15:11, 15:12, 18:9, 18:11, 18:12, 19:1, 19:8, 20:23, 21:2, 21:6, 21:8, 21:11, 21:13, 21:15, 27:13, 27:17, 27:19, 27:21, 29:5, 29:6, 29:7, 29:9, 29:13, 34:2, 34:4, 35:2, 35:3, 35:4, 35:7, 37:9, 39:22, 44:11, 44:13, 44:14, 46:9, 49:9, 49:12, 49:20, 49:23, 50:5, 50:6, 50:8, 50:14, 50:16, 50:20, 56:20, 57:5, 63:3, 63:5, 63:13, 66:15, 67:5, 67:7, 67:19, 71:13, 71:18, 73:3, 74:19, 75:18, 75:24, 76:12, 76:20, 80:14, 80:24, 83:14, 111:22, 112:2, 112:5, 120:11, 141:12, 141:22 <b>Water</b> [10] - 68:15,</p>

<p>71:11, 71:17, 71:19, 72:16, 85:4, 87:20, 169:16, 170:3, 170:7 <b>ways</b> [2] - 18:22, 60:12 <b>Weil</b> [1] - 4:21 <b>wEIL</b> [1] - 2:5 <b>well-head</b> [2] - 97:5, 97:25 <b>wellhead</b> [1] - 100:2 <b>wellheads</b> [1] - 100:8 <b>wells</b> [196] - 15:1, 16:9, 18:11, 18:17, 19:1, 19:2, 19:3, 19:5, 19:6, 19:8, 26:22, 34:5, 34:6, 42:23, 42:24, 43:1, 43:18, 43:22, 46:9, 47:9, 48:10, 49:10, 49:11, 49:14, 49:18, 50:12, 52:14, 52:15, 53:1, 53:5, 54:2, 54:9, 56:10, 58:4, 62:20, 63:23, 65:12, 65:14, 65:18, 66:13, 66:17, 67:17, 67:24, 68:2, 68:17, 69:18, 71:10, 71:13, 71:18, 74:11, 74:13, 74:16, 74:17, 74:18, 74:20, 75:2, 75:14, 75:23, 77:13, 81:25, 82:1, 82:16, 82:17, 83:17, 83:21, 84:3, 84:14, 86:18, 89:2, 91:24, 92:1, 93:16, 94:13, 94:22, 95:4, 95:12, 95:14, 95:17, 96:3, 99:25, 100:1, 101:12, 101:17, 102:13, 102:20, 103:11, 103:20, 104:5, 104:9, 104:13, 104:16, 104:20, 104:21, 104:22, 105:5, 105:8, 105:13, 105:20, 110:4, 110:6, 110:12, 112:2, 114:9, 115:4, 120:11, 120:20, 120:21, 120:24, 122:14, 122:15, 123:3, 123:24, 124:1, 124:4, 125:19, 125:20, 125:25, 126:3, 126:4, 130:8, 131:10, 131:11, 131:18, 131:23, 132:1, 132:2, 135:18, 135:24, 136:3, 137:12, 138:4, 138:20, 139:7, 139:12, 141:17,</p>	<p>141:25, 142:5, 142:6, 143:1, 143:8, 143:9, 143:10, 143:23, 144:24, 144:25, 148:8, 148:20, 149:1, 150:10, 150:13, 150:15, 150:16, 150:17, 150:19, 150:25, 151:6, 151:23, 152:15, 153:7, 153:17, 153:22, 154:1, 154:3, 154:14, 154:18, 154:25, 155:4, 155:8, 156:20, 156:23, 156:24, 157:2, 157:5, 157:23, 163:20, 163:21, 164:1, 164:3, 164:5, 164:11, 164:15, 164:23, 164:24, 165:22, 166:1, 166:12, 166:17, 167:21, 173:8, 173:9 <b>West</b> [2] - 47:24, 48:16 <b>west</b> [26] - 66:11, 66:12, 66:19, 69:18, 70:13, 76:1, 76:13, 76:20, 80:2, 80:3, 80:13, 80:16, 81:25, 83:21, 84:13, 85:10, 87:16, 90:19, 90:25, 91:8, 91:9, 93:15, 95:3, 132:22, 133:5, 146:24 <b>west-northwest</b> [2] - 76:1, 76:13 <b>Westbay</b> [4] - 101:25, 102:2, 103:13, 144:21 <b>Westbays</b> [3] - 102:14, 102:17, 102:20 <b>western</b> [4] - 81:20, 82:4, 82:9, 147:19 <b>wetland</b> [1] - 27:18 <b>whatsoever</b> [1] - 53:7 <b>whereas</b> [6] - 15:5, 15:10, 31:7, 37:13, 38:4, 52:17 <b>White</b> [2] - 12:15, 12:18 <b>wide</b> [2] - 21:10, 104:19 <b>wide-spread</b> [1] - 104:19 <b>widely</b> [5] - 22:23, 51:11, 56:2, 62:23, 104:12 <b>Windsor</b> [2] - 47:25, 48:16 <b>withdrawn</b> [3] - 62:16, 97:7, 169:21 <b>withdraws</b> [1] - 21:6 <b>withdrew</b> [1] - 169:24</p>	<p><b>witness</b> [10] - 5:20, 6:1, 7:6, 10:15, 10:16, 107:13, 108:8, 157:17, 175:12, 176:3 <b>WITNESS</b> [32] - 43:21, 48:15, 88:24, 91:13, 91:21, 91:25, 95:16, 95:21, 96:2, 97:17, 97:24, 98:2, 98:16, 99:22, 100:1, 100:5, 100:8, 100:15, 100:18, 102:14, 102:21, 104:3, 105:11, 105:17, 105:25, 106:3, 129:19, 155:24, 161:3, 161:6, 161:11, 175:11 <b>witness'</b> [1] - 6:7 <b>WOLFSON</b> [1] - 1:12 <b>words</b> [4] - 35:25, 49:4, 54:2, 86:25 <b>world</b> [2] - 8:16, 52:25 <b>worldwide</b> [1] - 9:11 <b>Worley</b> [3] - 9:3, 9:6, 9:8 <b>Wren</b> [1] - 4:18 <b>WREN</b> [2] - 1:20, 4:18 <b>writing</b> [2] - 97:9, 175:5 <b>written</b> [3] - 118:22, 168:6, 175:3 <b>wrote</b> [1] - 170:3</p>	<p>161:20, 161:22, 161:24, 164:6, 168:25, 169:6, 170:4, 170:11 <b>yellow</b> [4] - 14:9, 64:17, 71:16, 107:4 <b>yesterday</b> [1] - 169:22 <b>yield</b> [1] - 15:10 <b>yields</b> [1] - 15:13</p>
<b>Z</b>			
<p><b>zero</b> [1] - 30:14 <b>zigzags</b> [1] - 20:20 <b>Zone</b> [7] - 68:19, 69:7, 69:22, 75:14, 75:24, 76:19, 153:4 <b>zone</b> [30] - 12:21, 13:5, 13:9, 13:11, 13:12, 13:17, 50:16, 50:17, 53:16, 56:19, 56:24, 61:8, 61:11, 61:19, 62:15, 62:24, 69:7, 69:21, 75:11, 75:25, 76:14, 89:23, 102:12, 103:10, 103:18, 116:7, 118:4, 120:3 <b>zone"</b> [1] - 13:6 <b>Zones</b> [1] - 94:21 <b>zones</b> [10] - 68:20, 69:14, 76:16, 76:22, 87:16, 94:20, 94:21, 94:23, 104:8, 120:8</p>			
<b>X</b>			
<p><b>XOM-NJDEP-REM- 31310-1073785</b> [1] - 139:25</p>			
<b>Y</b>			
<p><b>year</b> [7] - 100:13, 112:23, 125:22, 128:25, 155:9, 166:23, 169:2 <b>years</b> [46] - 38:23, 44:24, 51:10, 54:17, 65:17, 65:18, 65:20, 70:4, 70:21, 77:16, 78:12, 101:1, 101:8, 101:9, 104:12, 106:8, 110:14, 110:15, 110:20, 112:17, 120:17, 120:25, 121:20, 122:23, 123:5, 125:21, 157:23, 158:5, 158:23, 159:14, 160:16, 160:19, 160:23, 161:1, 161:4, 161:10, 161:14, 161:19,</p>			